Automatic Stabilization and Redistribution in Europe and the US

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Chapter 1

Introduction

1.1 Motivation and key questions

The view that macroeconomic stabilization and income redistribution are important functions of government activity goes back to Musgrave (1939), but has gained renewed interest recently. The economic crisis in 2008-2009 has brought the issue of fiscal policy as a stabilization tool back to the agenda of both policy-makers and academic research. The tremendous growth in income inequality which can be observed in many industrialized countries in the last decades and the surge in income shares of the top 1%, in particular in Anglo-Saxon countries such as the US[1], has fuelled a 'tax-the-rich' debate and discussions how to design a fair tax system.[2] While a large strand of the theoretical literature in public finance and macroeconomics focuses on normative questions with regard to the optimal level of stabilization and income redistribution[3], it is an open question how much insurance and redistribution existing tax and transfer systems actually generate. This book consists of four essays which aim to shed light on this question. Importantly,

[1] Cf. Piketty and Saez (2003).

[2] "We are the 99%" is one of the central slogans of the protest movement 'Occupy Wall Street' which has its origin in the US and subsequently gained popularity in other countries. To a large extent, the protests are based on the perception that the incomes of the top 1% have decoupled from the rest of the population. Claims that taxes on top earners should be raised were recently high on the agenda in the election campaigns in the US and France.

[3] See e.g. a recent paper by Piketty, Saez and Stantcheva (2011) for a model of optimal taxation of top labor incomes.

the essays do not give value judgements but contain comprehensive empirical and purely positive analyses.

In chapters 2 and 3, we start by investigating the stabilizing function of tax and transfer systems. We assess to what extent tax and transfer systems in the EU and the US have provided income insurance through automatic stabilization in the recent economic crisis. When the financial crisis turned into a broader macroeconomic crisis, many observers urged governments to use discretionary fiscal policy in order to counteract a further slowdown of the global economy.[4] Policy-makers widely followed this advice. For example, with the American Recovery and Reinvestment Act the US administration passed one of the largest fiscal stimulus programs in US history.[5] Much less attention was devoted to the workings of automatic stabilizers. One exception was Auerbach (2009) who suggested that weak automatic stabilizers, estimated to be on a historically low level in the US before the economic crisis unfolded, are a key explanatory factor for the renewed use of discretionary fiscal policy by the US government. In line with this view, there is the widespread opinion that automatic stabilizers are much more important in Europe than in the US. Jürgen Stark, a former member of the Board of the European Central Bank, emphasized at an early stage of the crisis that more than half of the fiscal impulse in the euro area for the years 2009-2010 was due to automatic stabilizers.[6] Given that estimates of automatic stabilizers based on macroeconomic data raise a number of methodological issues and in light of a lack of comparable micro estimates, the key question which we address in chapter 2 is:

"How large is the EU-US stabilization gap?"

Our main contribution in chapter 2 is that we provide micro estimates for the EU-US stabilization gap in a consistent framework and for two distinct shock scenarios. In chapter 3, we extend this analysis and ask:

"How do European tax and transfer systems protect households at different income levels against losses in current income?"

[4] For example, the IMF argued: *"The optimal fiscal package should be timely, large, lasting, diversified, contingent, collective, and sustainable."* Cf. Spilimbergo, Symansky, Blanchard and Cottarelli (2008), page 2.

[5] Overall costs of this fiscal stimulus are estimated to exceed $800 billion (see e.g. Congressional Budget Office (2011) and Wilson (2012)).

[6] Interview with Frankfurter Allgemeine Zeitung on May 20th 2009.

This is an important question since one lesson from past recessions is that income and job losses are distributed rather unequally across the income distribution.[7]

In chapter 4, we examine the redistributive role of the US tax system in the last three decades. The analysis is motivated by the fact that in this time period significant changes in tax legislation coincided with a dramatic increase in income inequality. While income inequality has been increasing in most OECD countries in the last decades, the trend was particularly pronounced in the US. In terms of legislative changes, major reforms of the US federal income tax system occured in the 1980s, early 1990s as well as during the last decade. The tax reforms in the 1980s were characterized by reductions in marginal tax rates and a broadening of the tax base. The trend of declining marginal tax rates was to some extent reversed in the 1990s. At the same time major expansions of the Earned Income Tax Credit (EITC) were implemented.[8] Marginal tax rates were again reduced by provisions enacted in the early 2000s and as part of the fiscal stimulus program in 2009. An obvious question that arises from these observations but which has not been sufficiently addressed in the literature is elaborated on in chapter 4:

"To what extent have changes in US tax policy counteracted or accelerated the rise in income inequality?"

The main contribution of this chapter is to disentangle the impact of tax policy changes from other factors which have influenced the rise in pre-tax income inequality.

Chapter 5 is motivated by the observation that tax policy changes in the US have had inequality–increasing and –decreasing effects which broadly follow the political cycle. We calculate time series on automatic stabilizers in the US and find a similar pattern. A serious concern with previous studies examining partisan effects on economic outcomes is that that the dependent variable, for example income inequality, is often influenced by factors which are beyond the control of the government. A crucial advantage of the policy effect calculated in chapter 4 and used as dependent variable in chapter 5 is that it captures the 'intended effect'

[7] Cf. Heathcote, Perri and Violante (2010) and Hoynes, Miller and Schaller (2012) for the US and Domeij and Floden (2010) for Sweden.

[8] The EITC provides cash assistance to the working poor and has gained significantly in importance relative to traditional welfare programs in the US. See e.g. Eissa and Hoynes (2011).

of a policy reform as can reasonably be argued. Our empirical analysis is based on a panel of US states spanning the last three decades and sheds light on the following question:

"Are there significant differences in the stabilizing and redistributive role of the US income tax system under Democratic and Republican administrations?"

The rest of this introductory chapter is structured as follows. In section 1.2, we introduce the technique of counterfactual simulations which is the core methodological approach used in this book. Section 1.3 summarizes the main results of the following chapters.

1.2 Empirical approach: Counterfactual simulations

A central methodological approach which is applied in the subsequent analyses is the technique of counterfactual simulations to identify the parameters of interest. Simulation analysis allows conducting a controlled experiment by changing certain parameters while holding everything else constant.[9] In chapters 2 and 3, the parameters of interest are summary measures for the degree of automatic stabilization of household disposable income after the economy is hit by an aggregate shock. In chapter 4, the direct effect of tax policy on income inequality is investigated. In chapter 5, the policy effect obtained from counterfactual simulations is used as dependent variable in a set of panel regressions. In this section, we first briefly introduce the microsimulation models used in this book and then describe the empirical strategy of counterfactual simulations.

The microsimulation models EUROMOD, a tax-benefit model for the European Union, and TAXSIM, the NBER's model for US federal and state income tax laws, are important tools for the analyses in chapter 2-4.[10] The models simulate

[9] Cf. Bourguignon and Spadaro (2006).

[10] 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-

direct taxes and cash benefits for representative micro-data samples of households which serve as model input.[11] They are static in the sense that they do not consider behavioral reactions of households to policy changes, but focus on 'first-round' effects. In principle, by estimating behavorial responses it is possible to incorporate 'second-round' effects in the analysis. Furthermore, the models assume full benefit take-up and tax compliance focusing on the intended effects of tax-benefits systems. In general, microsimulation models are widely used for ex-ante analyses of hypothetical reforms of the tax and transfer system. By changing the policy parameters in the model, the policy-analyst can simulate and evaluate the new policy with regard to its distributional and, in case behavorial reactions are accounted for, efficiency effects.

In chapters 2 and 3, we run counterfactual simulations by changing model *input* parameters, but keep everything else constant including the policy parameters. More precisely, we manipulate the input data by simulating macro shocks to income and employment. These controlled experiments enable us to calculate the shock-absorption capacity of different tax and transfer systems which can be interpreted as a summary measure for automatic stabilization of income. A key advantage of this approach is that we can single out the role of automatic stabilizers from discretionary fiscal policy and behavioral reactions of economic agents which is hard to achieve in an ex-post analysis based on macroeconomic aggregates.

The analysis presented in chapter 4 is based on counterfactual simulations with the aim to isolate the impact of tax policy on income inequality. The usual approach in the literature analyzing the redistributive capacity of a given tax system is to compare pre- and post-tax inequality. As tax burdens and their impact on the income distribution are determined by both tax schedule and tax base, it is unclear how much of an observed change in tax burdens is due to policy reforms and how much due to changes in the pre-tax income distribution. We overcome this shortcoming by applying a decomposition method that allows us

benefit models (where available), and the robustness checked through numerous applications (see, e.g., Bargain (2006)).

[11] The TAXSIM model incorporates all benefits which are provided through the income tax system, in particular the Earned Income Tax Credity (EITC) and various other tax credits. EUROMOD can simulate most of the benefits which are not based on previous contributions as this information is usually not available from the cross-sectional survey data used as input datasets.

to disentangle mechanical effects due to changes in pre-tax incomes from direct effects of policy reforms. Our counterfactual simulations consist of policy swaps in which the tax system of year t is applied to the population of year $t+1$ and vice versa. Performing these swaps on a year-to-year basis over an extended period of thirty years, we are able to determine how income inequality would have developed if tax policy parameters had not changed, or to put it differently, to what extent changes in inequality are driven by tax policy and other factors. Chapter 5 uses some of these variables as left-hand side variables in a set of panel regressions.

1.3 Summary of results

Chapter 2: Automatic stabilizers and economic crisis: US vs. Europe

We compare a proportional income shock to an asymmetric unemployment shock and show that the strength of automatic stabilizers crucially depends on the type of shock.[12] In case of the proportional income shock, automatic stabilizers aborb 38% of the shock in the EU compared to 32% in the US. The EU-US stabilization gap widens substantially in case of the unemployment shock when 47% of the shock is absorbed in the EU compared to 34% in the US. We then use various methods in order to estimate the prevalence of credit constraints among households, in particular sample-splitting techniques based on wealth and homeownership and direct survey questions on household finances. Based on this information, we assess how the cushioning of disposable income translates into demand stabilization. Demand stabilization is up to 30% in the EU and up to 20% in the US. Our results suggest that social transfers play a key role for stabilization of income and demand and explain an important part of the difference in automatic stabilizers between Europe and the US. The country decomposition reveals that there is large heterogeneity within the EU. Automatic stabilizers in Eastern and Southern Europe are much lower than in Central and Northern European countries. In three extensions, we consider the stabilizing impact of employer social insurance contributions, consumption taxes and in-kind benefits.

[12] Economic downturns are typically characterized by a mixture of these two stylized shock scenarios. Reductions in disposable household income can be caused by job losses (extensive margin) or wage and hours of work adjustments (intensive margin).

Chapter 3: Automatic stabilizers, economic crisis and income distribution in Europe

Chapter 3 builds on the framework presented in chapter 2, but focuses on the distributional effects of the shock scenarios and to what extent tax and transfer systems in Europe protect households at different income levels against losses in current income. Our main results are as follows. Firstly, we find that the aggregate redistributive effects of the tax and transfer systems increases in response to the shocks. Secondly, we show that European tax–benefit systems place unequal weights on the extent how different income groups are protected. In case of the unemployment shock, some Eastern and Southern European countries provide little income stabilization for low-income groups whereas the opposite is true for the majority of Nordic and continental European countries. Thirdly, we find that tax–benefit systems with high built-in automatic stabilizers are also those which are more effective in mitigating existing inequalities in market income.

Chapter 4: Tax policy and income inequality in the US, 1978-2009: A decomposition approach

We apply a decomposition approach which separates the direct effects of policy reforms on inequality from other factors, including indirect policy effects due to behavioral responses. We find that the increase in post-tax income inequality was slower than that of pre–tax inequality indicating that the redistributive role of the tax system has increased over time. However, our decomposition reveals that most of this increase in redistribution was not due to the policy effect but a mechanical consequence of the rising inequality in pre–tax income. Looking at specific reforms, we find sizable policy effects which are sometimes as important as changes in the pre-tax income distribution. There are significant differences between results for the lower and upper parts of the distribution. While tax reforms implemented under Democratic administrations, in particular the EITC reforms in the 1990s and provisions enacted through the American Recovery and Reinvestment Act in 2009, had an equalizing effect at the lower half of the distribution, the disequalizing effects of the Reagan and Bush reforms in the 1980s and early 2000s are due to tax cuts for high-income families. Overall policy effects almost cancel out over the

whole time period.

Chapter 5: Stabilization, redistribution and the political cycle in the US

In the first part of chapter 5, we investigate how automatic stabilizers in the US have changed in the last three decades and find that tax reforms in the 1980s and early 2000s which caused post-tax inequality to rise weakened automatic stabilizers whereas the opposite effect can be observed for tax reforms in the late 1970s and early 1990s. Calculating automatic stabilizers for each state separately we find a large heterogeneity in income insurance across states which is mainly caused by differences in income taxation on the state level, but also by differences in income distributions across states.

In the second part of chapter 5, we shed light on the relationship between the political cycle and changes in the US income tax system. We exploit the institutional framework in the US that redistribution occurs both on the federal as well as the state level and estimate a set of panel regressions for the US states spanning the time period 1978-2008. In particular, we examine how the tax burden in each state, automatic stabilizers and the tax policy effect on inequality are affected by Democratic and Republican governments. Our results provide strong evidence for the hypothesis that tax legislation enacted by Republican and Democratic governments significantly differs in terms of its redistributive effect. Most strikingly, tax policy changes enacted by Democratic administrations on the federal and state level lead to reductions in post-tax inequality ranging between 4-9% depending on the inequality measure.

Chapter 2

Automatic stabilizers and economic crisis: US vs. Europe

2.1 Introduction

In the recent economic crisis, the workings of automatic stabilizers are widely seen to play a key role in providing income insurance for households and hence in stabilizing demand and output. Automatic stabilizers are usually defined as those elements of fiscal policy which mitigate output fluctuations without discretionary government action. 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 for the recent 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 (e.g. Girouard and André (2005)). Exceptions based on micro data are Auerbach and Feenberg (2000) and Kniesner and Ziliak (2002 a, b) 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 chapter, 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.[1] 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 (see Bourguignon and Spadaro (2006)). Thus we can single out the role of automatic stabilization. This is much more difficult in an ex-post evaluation (or with macro level 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 in such a framework. Our simulation analysis therefore complements the macro literature on the relationship between government size and volatility (e.g., Galí (1994), Fatàs and Mihov (2001)) by providing estimates for the size of automatic stabilizers based on micro data.

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 aggregate shocks in microsimulation studies analyzing automatic stabilizers and is also consistent with some of the macro literature (e.g. Sachs and Sala-i Martin (1992)). 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 shock where some households become unemployed, so that the unemployment rate increases such that total household income decreases by 5% (unemployment shock). This idiosyncratic shock affects each household in a different way with income losses ranging between zero (if the household is not affected) and total household gross income (in case all members of the household become unemployed). 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, Pischke and Souleles (1998)). On this basis,

[1] This chapter is based on Dolls, Fuest and Peichl (2012).

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.[2] 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.[3] This is especially important for assessing the effectiveness of automatic stabilizers in the recent 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 account unemployment benefits and state level income taxes. This explains why our estimates of overall automatic stabilization effects in the US are higher. In three extensions, we also consider consumption taxes, employer's contributions and in-kind benefits. 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.[4] This is of key importance for

[2] 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 (2010).

[3] 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.

[4] 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, Parker

assessing the role of automatic stabilizers for demand smoothing. Moreover, we use several strategies for estimating liquidity constraints in order to explore the sensitivity of demand stabilization results. 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 explore whether macro indicators are a good proxy for our micro estimates with respect to the EU-US stabilization gap. We also investigate whether larger 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 the forces driving differences in automatic stabilizers. 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%. To some extent this result qualifies the widespread view that automatic stabilizers in Europe are much higher than in the US, at least as far as proportional macro 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 idiosyncratic unemployment shock, the stabilization gap 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. Compared to conventional macro estimates for the size of automatic stabilization, the EU-US stabilization gap we find is smaller in case of the proportional income shock, whereas it is of similar magnitude for the asymmetric unemployment shock.

How does this cushioning of shocks translate into demand stabilization? If demand stabilization can only be achieved for liquidity constrained households, the picture changes significantly. Here, the results are sensitive with respect to

and Souleles (2006), Shapiro and Slemrod (1995, 2003, 2009))

the method used for estimating liquidity constraints. For the income shock, the cushioning effect of automatic stabilizers is now in the range of 4-22% in the EU and between 6-17% in the US. For the unemployment shock, however, we find a larger difference. In the EU, the stabilization effect substantially exceeds the comparable US value for all liquidity constraint estimation methods. It ranges from 13-30% whereas results for the US are between 7-20% and are 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. We find a weak (negative) correlation between the size of fiscal stimulus programs and automatic stabilizers. Moreover, we find that discretionary fiscal policy programs have been smaller in more open economies.

The paper is structured as follows. In Section 2.2 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 2.3 describes the microsimulation models EUROMOD and TAXSIM and the different macro shock scenarios we consider. Section 5.5 presents the results on automatic stabilization which are discussed in Section 2.5 together with potential limitations of our approach. Section 4.5 concludes.

2.2 Previous research and theoretical framework

2.2.1 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[5], two types of studies prevail: macro data studies and mi-

[5] A theoretical analysis of automatic stabilizers in a real business cycle (RBC) model can be found in Galí (1994). One issue of standard RBC models is that they are not able to explain

cro data approaches.[6] Simple macro indicators such as revenue and expenditure to GDP ratios are used by IMF (2009) as a measure of automatic stabilization. More sophisticated approaches measure the cyclical elasticity of different budget components such as the income tax, social security contributions, the corporate tax, indirect taxes or unemployment benefits. Different empirical strategies have been proposed, for example regressing changes in fiscal variables on the growth rate of GDP or estimating elasticities on the basis of macro-econometric models.[7] 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. Kniesner and Ziliak (2002b) analyze (ex-post) the impact of the US tax reforms of the 1980's on automatic stabilization of consumption and find a reduction in consumption stability of about 50% induced by ERTA81 and TRA86. 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%.

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the stylized fact that the size of government (as a proxy for automatic stabilizers) is negatively correlated with the volatility of business cycles. In fact, under some reasonable assumptions, a standard RBC model produces a positive correlation (Andrés, Domenech and Fatas (2008)). In addition, such models are not able to explain evidence that consumption responds positively to increases in government spending (Blanchard and Perotti (2002), Fatàs and Mihov (2002) or Perotti (2002)). These facts, however, can be easily explained by a simple textbook IS-LM model as well as by large-scale macroeconometric models (van den Noord (2000), Buti and van den Noord (2004)). Galí, López-Salido and Vallés (2007) and Andrés et al. (2008) show that both facts can only be explained in a RBC model by adding Keynesian features like nominal and real rigidities in combination with rule-of-thumb consumers to the analysis.

[6] 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).

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

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%.[8] 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 estimates 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 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, Glaeser and Sacerdote (2005)) and discuss to what extent differences in economic outcomes such as hours worked can be explained

[8] 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, Levy, Lietz, Mantovani and Sutherland (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.

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.

2.2.2 Theoretical framework

The extent to which automatic stabilizers mitigate the impact of income shocks on household demand essentially depends on two factors. First, 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 some households are liquidity constrained or acting as "*rule-of-thumb*" consumers (Campbell and Mankiw (1989)). 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:

$$Y_i^M = E_i + Q_i + I_i + P_i + O_i \tag{2.2.1}$$

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 $G_i = T_i + S_i - B_i$:

$$Y_i^D = Y_i^M - G_i = Y_i^M - (T_i + S_i - B_i) \tag{2.2.2}$$

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 2.4.4.

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:

$$\tau^I = \tau^I(Y^M, T, S, B). \tag{2.2.3}$$

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):

$$\Delta Y^D = \left(1 - \tau^I\right) \Delta Y^M \tag{2.2.4}$$

However, one issue when computing τ^I based on the change of macro level aggregates is that macro data changes include behavioral and general equilibrium effects as well as discretionary policy measures. Therefore, a measure of automatic stabilization based on macro data changes captures all these effects. Thus, it is not possible to disentangle the automatic stabilization from stabilization through discretionary policies or changes in behavior because of endogeneity and identification problems. That is why in these studies the correlation between government

size and output volatility is analyzed as a proxy for automatic stabilization.

To complement the macro literature and in order to isolate the impact of automatic stabilization from other effects, 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 data information taken from a microsimulation tax-benefit calculator, which - by definition - avoids endogeneity problems by simulating exogenous changes (Bourguignon and Spadaro (2006))[9]:

$$\begin{aligned} \sum_i \Delta Y_i^D &= (1-\tau^I)\sum_i \Delta Y_i^M \\ \tau^I &= 1 - \frac{\sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M} = \frac{\sum_i \left(\Delta Y_i^M - \Delta Y_i^D\right)}{\sum_i \Delta Y_i^M} = \frac{\sum_i \Delta G_i}{\sum_i \Delta Y_i^M} \end{aligned} \quad (2.2.5)$$

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. Thus, τ^I can be interpreted as a measure of income insurance provided by the government, $(1-\tau^I)$ as a measure of vulnerability to income shocks. 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 is close to the one of an average effective marginal tax rate (EMTR), see e.g. 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 (2002), Kleven and Kreiner (2006) or Immervoll, Kleven, Kreiner and Saez (2007)).

Another advantage of the micro data based approach is that it enables us to explore the extent to which different individual components of the tax transfer

[9] Note that a potential drawback of this approach is that we neglect general equilibrium effects as well as behavioral adjustments as a response to an income shock. This, however, is done on purpose, as we do not aim at quantifying the overall adjustment to a shock but to single out the size of automatic stabilizers, which - by definition - automatically smooth incomes without taking into account the effects of discretionary policy action or behavioral responses.

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:

$$\tau^I = \sum_f \tau_f^I = \tau_T^I + \tau_S^I + \tau_B^I = \frac{\sum_i \Delta T_i}{\sum_i \Delta Y_i^M} + \frac{\sum_i \Delta S_i}{\sum_i \Delta Y_i^M} - \frac{\sum_i \Delta B_i}{\sum_i \Delta Y_i^M} = \frac{\sum_i (\Delta T_i + \Delta S_i - \Delta B_i)}{\sum_i \Delta Y_i^M} \tag{2.2.6}$$

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.[10] This is a strong assumption leading to a lower bound for demand stabilization which would be higher if non-liquidity constrained households adjusted their consumption as well. Furthermore, we implicitly assume that the shock is completely temporary. If the shock was permanent and all household changed their consumption accordingly, demand stabilization would equal income stabilization (upper bound).[11] Hence, the 'real' stabilization will be a weighted sum of the two stabilization coefficients depending on the share of households adjusting their consumption.

The adjustment of liquidity constrained households is such that changes in

[10] 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.

[11] Of course, in the presence of a permanent shock the consumption reaction of households would also depend on their expectations regarding the adjustment of public expenditures and, hence, future tax burdens.

disposable income are equal to changes in consumption. Hence, the coefficient which measures stabilization of aggregate demand becomes:

$$\tau^C = 1 - \frac{\sum_i \Delta C_i^{LQ}}{\sum_i \Delta Y_i^M} \tag{2.2.7}$$

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 the literature on the estimation of the prevalence of liquidity constraints, several approaches have been used. Recent surveys of the different methods show that there is no perfect approach since each approach has its own drawbacks (see Jappelli et al. (1998) and Jappelli and Pistaferri (2010)). Therefore, 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 three 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 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:

$$LQ_i = \mathbf{1}\left[W_i \leq \frac{2}{12} Y_i^D\right] \tag{2.2.8}$$

The second approach makes use of information regarding homeowners in the data and classifies those households as liquidity constrained who do not own their home (see, e.g. Runkle (1991)).[12] However, common points of criticism on sample splitting techniques based on wealth are that wealth is a good predictor of liquidity constraints only if the relation between the two is approximately monotonic and that assets and asset incomes are often poorly measured (see, e.g. Jappelli et al. (1998)). Therefore, in a third approach we use direct information from household surveys for the identification of liquidity constrained household (Jappelli et al.

[12] When modifying this approach such that in addition to non-homeowners also households with outstanding mortgage payments on their homes are classified as liquidity constrained, the results change and are much closer to the Zeldes criterion. As an additional robustness check, we also defined unemployed people as liquidity constrained. The results are similar to the non-homeowners approach.

(1998)). Our data for the US, the Survey of Consumer Finances (SCF), 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 third approach, we classify all US households as liquidity constrained who answer one of the questions above with "*yes*". As no comparable information is available in our data for European countries, 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[13], we are able to detect liquidity constrained households in our data for the European countries.[14]

A recent survey of the vast literature on consumption responses to income changes can be found in Jappelli and Pistaferri (2010). A key finding from this literature is that the heterogeneity of households has to be taken into account in the analysis of consumption responses since liquidity constraints of population subgroups can explain different consumption responses. We are aware that the approaches we have chosen to account for such constraints can only be approximations for real household behavior in the event of income shocks. They provide a range for demand stabilization due to automatic stabilization. The first approach is likely to give an upper bound since the provision of government insurance reduces incentives to engage in precautionary savings and holdings of liquid assets. Conversely, estimates based on the third approach, i.e. identification of liquidity constrained households through direct survey evidence, are likely to give a lower bound given estimates found in the literature (cf. Jappelli et al. (1998)).

[13] Results of these estimations are available from the authors upon request.

[14] To check the robustness of the third approach and to make sure that the estimation of liquidity constraints based on survey evidence is comparable between the US and the EU, we make two extensions. First, we employ a similar question in the SCF as used in the EU SILC data ("i*n an emergency, could you get financial assistance of $3000 or more (...)?*"). Using this question for the US, we find exactly the same amount of demand stabilization as obtained with the questions about credit applications. Second, we make a further robustness check for the EU SILC data and exploit information about arrears on mortgage payments, utility bills and hire purchase instalments yielding similar shares of liquidity constrained households and thus similar stabilization results. These two extensions support our view that the estimations based on survey evidence are robust and, at least to some extent, comparable between the US and the EU.

2.3 Data and methodology

2.3.1 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.[15] The models can simulate direct taxes and most benefits (on all levels of government) 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.

[15] 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)).

2.3.2 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 recent 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 an idiosyncratic shock 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.[16]

Our scenarios can be seen as a conservative estimate of the impact of the recent 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 paper. Therefore, we focus on these two simple scenarios in order to make our analysis as simple as possible.

The increase of the unemployment rate is modeled through reweighting of our samples.[17] The weights of the unemployed are increased while those of the em-

[16] One should note, though, that our analysis is not a forecasting exercise. We do not aim at quantifying the exact effects of the recent 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, Björklund, Jäntti, Pedersen, Smith and Wennemo (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.

[17] For the reweighting 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

ployed 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 2.7.2). The implicit assumption behind this approach is that the socio-demographic characteristics of the unemployed remain constant.[18]

2.4 Results

2.4.1 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 2.4.1 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 proportional 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 noteworthy in so far as automatic stabilizers in Europe are usually considered to be much higher than in the US.[19] Our results qualify this view to a certain degree, at least as far as proportional income shocks are concerned. Figure 2.4.1 shows that taxes and social insurance contributions are the dominating factors which drive τ in case of a uniform income

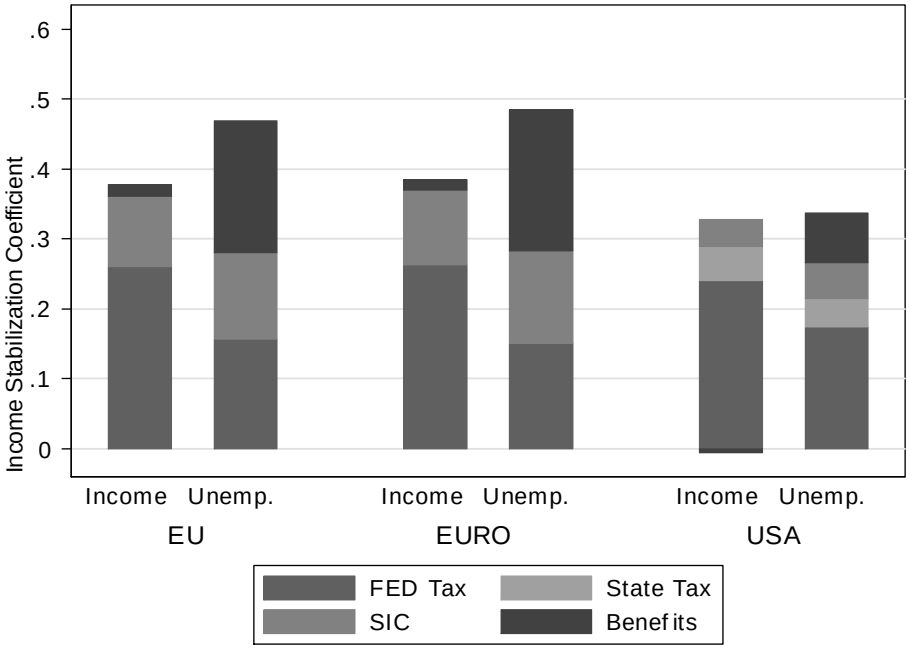
distribution and the employment rate.

[18] Cf. Deville and Särndal (1992) and DiNardo, Fortin and Lemieux (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 (2010)). 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.

[19] 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).

shock. Benefits are of minor importance in this scenario.

Figure 2.4.1: Decomposition of stabilization coefficient for both scenarios



Source: Own calculations based on EUROMOD and TAXSIM

In the case of the idiosyncratic unemployment shock, the stabilization gap between the EU and the US increases. 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 (duration and generosity) which account for a large part of stabilization in Europe in this scenario.[20] Table 2.7.2 in the Appendix shows that benefits alone absorb 19% of the shock in Europe compared to just 7% in the US.

[20] Note that in our baseline analysis we do not account for the Extended Benefits (EB) program in the US because it does not kick in automatically in all states. The EB program provides an additional 13 to 20 weeks of unemployment benefits to workers receiving unemployment insurance in states that meet certain thresholds in terms of their unemployment rates. This increased duration of unemployment benefits slightly increases the stabilization coefficient for the US and, thus, reduces the difference to the EU.

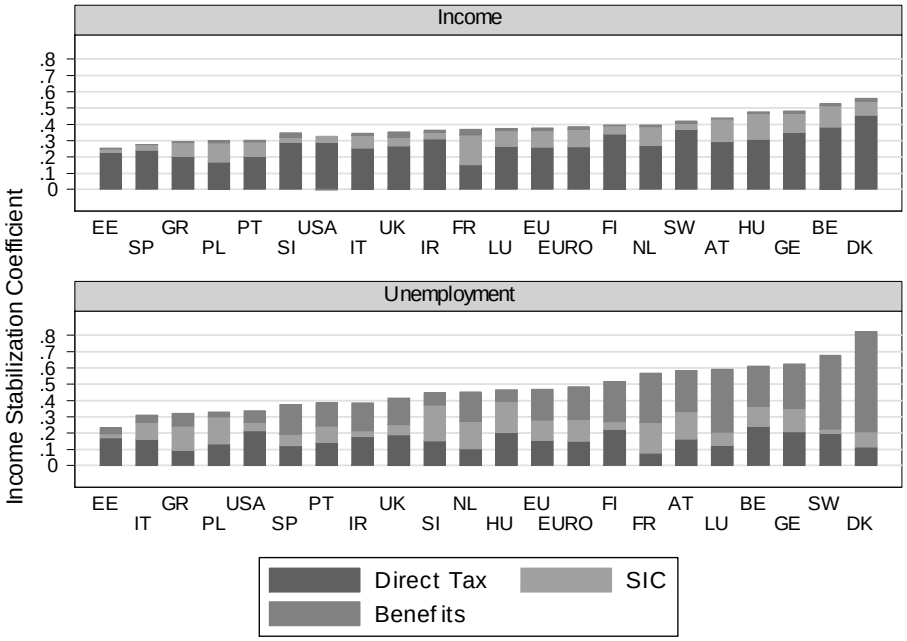
2.4.2 Country decomposition

The results for the stabilization coefficient vary considerably across countries, as can be seen from Figure 2.4.2 (and Tables 2.7.1 and 2.7.2 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 high stabilization value for Hungary stems from the rather high progressivity of the income tax, at least compared to the other countries from Eastern Europe which have (partial) flat tax systems. 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. France is an interesting case as it has a very progressive tax schedule which, however, is levied on a very narrow tax base. This leads to a rather low level of income tax revenue, whereas the share of social security contributions (to total tax revenue or GDP) is much higher.

In case of the asymmetric unemployment shock, the stabilization coefficients are larger for the majority of countries. The variation across countries can be explained mainly with the generosity and duration of (unemployment) benefit receipt. 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%) and, to a lesser extent, Italy (31%) and Poland (33%).

When looking only at the personal income tax, it is noteworthy 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)).

Figure 2.4.2: Decomposition of income stabilization coefficient in both scenarios for different countries



Source: Own calculations based on EUROMOD and TAXSIM

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.

An interesting question is to what extent the results for the stabilization coefficient are driven by the existing tax and transfer systems or by the demographic characteristics in each country. To investigate this issue, we recalculate the income stabilization coefficients for each country under the given tax and transfer system, but with the socio-demographic characteristics of each other country in our analysis. This analysis yields a 20*20 matrix where the respective tax and transfer systems are given in the columns and the demographics of each country in the rows. As can be seen in Table 2.7.6, the income stabilization coefficients computed under a fixed tax and transfer system but with varying characteristics of the

population do not vary much. There is much more variation within a certain row (showing the income stabilization coefficients calculated with demographic characteristics of a certain country but varying tax and transfer systems) than within a certain column (fixed tax and transfer system of a certain country, but varying population characteristics). Interestingly, the income stabilization coefficient for the US is highest with the socio-demographic characteristics of the US population whereas income stabilization is (almost) lowest in countries such Italy, Portugal, Slovenia or the UK with their given population characteristics.[21] Thus, we conclude that the tax and transfer rules and not the demographic characteristics are the main determinants of the income stabilization coefficient.

2.4.3 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 2.4.1 and Figure 2.4.3.[22] 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 4-22% for the EU and from 6-17% 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 direct survey evidence with respect to liquidity constraints on average give the lower bound whereas those based on home ownership information usually lie in between. 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 of 30%. These results suggest that the transfers to the unemployed, in particular the rather generous systems of unem-

[21] We obtain similar results for the unemployment shock and the demand stabilization coefficient.

[22] Note that in Tables 2.4.1 and 2.7.3 as well as in Figure 2.4.3, 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) and the third refers to survey evidence.

ployment insurance in Europe, play a key role for demand stabilization and drive the difference in automatic stabilizers between Europe and the US.

Table 2.4.1: Demand stabilization coefficients

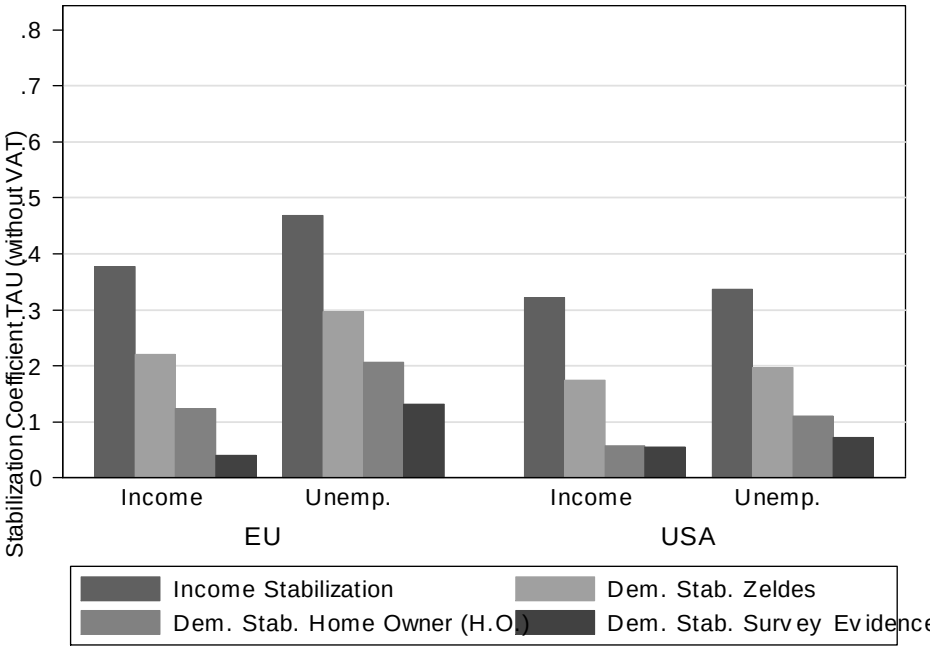
	$\tau_1^C IS$	$\tau_2^C IS$	$\tau_3^C IS$	$\tau_1^C US$	$\tau_2^C US$	$\tau_3^C US$	$\tau^I IS$	$\tau^I US$
AT	0.363	0.170	0.036	0.497	0.271	0.138	0.439	0.585
BE	0.345	0.097	0.021	0.442	0.184	0.105	0.527	0.612
DK	0.285	0.135	0.020	0.592	0.257	0.230	0.558	0.823
EE	0.242	0.030	0.008	0.225	0.029	0.063	0.253	0.233
FI	0.248	0.097	0.033	0.352	0.191	0.119	0.396	0.519
FR	0.115	0.146	0.048	0.259	0.304	0.164	0.370	0.568
GE	0.143	0.246	0.080	0.253	0.380	0.235	0.481	0.624
GR	0.230	0.078	0.007	0.263	0.087	0.027	0.291	0.322
HU	0.455	0.035	0.121	0.448	0.035	0.185	0.476	0.467
IR	0.186	0.037	0.034	0.243	0.083	0.132	0.363	0.387
IT	0.283	0.068	0.019	0.233	0.057	0.033	0.346	0.311
LU	0.256	0.115	0.025	0.440	0.149	0.098	0.374	0.593
NL	0.227	0.094	0.025	0.288	0.170	0.119	0.397	0.452
PL	0.296	0.144	0.056	0.324	0.164	0.097	0.301	0.329
PT	0.240	0.073	0.007	0.313	0.140	0.008	0.303	0.386
SI	0.090	0.021	0.030	0.227	0.036	0.083	0.317	0.431
SP	0.183	0.039	0.014	0.264	0.060	0.057	0.277	0.376
SW	0.201	0.318	0.028	0.409	0.544	0.159	0.420	0.678
UK	0.263	0.063	0.024	0.349	0.186	0.164	0.352	0.415
EU	0.221	0.124	0.041	0.297	0.207	0.132	0.378	0.469
EURO	0.195	0.131	0.040	0.270	0.212	0.126	0.385	0.485
USA	0.174	0.058	0.056	0.197	0.111	0.073	0.322	0.337

Source: Own calculations based on EUROMOD and TAXSIM. Notes: τ^C: demand stabilization coefficient, τ^I : income stabilization coefficient, IS: income shock, US: unemployment shock. 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) and the third refers to survey evidence.

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 2.7.3 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 2.7.3.[23] For this reason, automatic 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.

Figure 2.4.3: Income vs. demand stabilization



Source: Own calculations based on EUROMOD and TAXSIM

Finally, focusing on results for individual EU countries, there is large heterogeneity in demand stabilization across countries and, at least for some countries,

[23] 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 2.7.3).

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 such as Denmark, Germany or Sweden is above the EU average.[24]

2.4.4 Extensions: Employer social insurance contributions, consumption taxes and in-kind benefits

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 account for employer social insurance contributions, consumption taxes – which include value added, excise and sales taxes – as well as in-kind benefits. We did not include these taxes in our baseline simulations because they raise specific conceptual issues.

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.

[24]Note that this holds for both the income shock as well as for the unemployment shock.

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:

$$Y_i^G = Y_i^M + S_i^{ER} \tag{2.4.1}$$

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 2.7.4 in the Appendix. 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. 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.

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 implicit tax rates (ITR) on consumption taken from European Commission

(2009b) for European countries and McIntyre, Denk, Francis, Gardner, Gomaa, Hsu and Sims (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:

$$\tau^{Ct} = \frac{\sum_h \left(\Delta T_h^C + \Delta T_h + \Delta S_h - \Delta B_h\right)}{\sum_i \Delta Y_i^M} \tag{2.4.2}$$

where h is the index for the liquidity constrained households.

The results are given in Table 2.7.5 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.

In-kind benefits

One limitation of the microsimulation models we use is that in-kind benefits are not taken into account due to data limitations.[25] As the levels of non-cash transfers

[25] An exception is Paulus, Sutherland and Tsakloglou (2010) who impute in-kind benefits in EUROMOD for 5 countries.

differ across countries (see, e.g., Garfinkel, Rainwater and Smeeding (2006)), this has implications for the cross country differences in the size of automatic stabilizers. Part of the EU-US *taxation* gap can be explained by the fact that non-cash benefits are on average higher (in relative terms) in Europe than in the US (see e.g. Marical, d'Ercole, Vaalavuo and Verbist (2006), p. 12). The impact on the differences in automatic stabilizers is, however, less clear as it depends on various factors.

First, the distribution of these benefits across households matters. Usually, they are more evenly distributed than cash benefits (Garfinkel et al. (2006), Marical et al. (2006)). Second, the (automatic) change of non-cash benefits over the business cycle plays a key role. Here the available empirical evidence is thin. The standard assumption in the literature on automatic stabilization is that in-kind benefits do not – automatically – change over the business cycle (Auerbach and Feenberg (2000), Perotti (2002)). Darby and Melitz (2008) find that, empirically, health care expenditure is slightly countercyclical. The explanation they give is that the opportunity cost of using health care services is lower in recessions – people have more time to see the doctor.[26] If it is true that in-kind benefits increase in a downturn (Darby and Melitz (2008)), the stabilization coefficients calculated in the preceding sections, which neglect in-kind benefits, would underestimate the true stabilization effect.

In order to address the issue of non-cash transfers, we conduct a rather rough imputation of in-kind benefits in our simulation models following the approach of Paulus et al. (2010). Marical et al. (2006) report in Table A.8 the ratio between in-kind benefits from public services (health, education, public housing) and disposable income of households for each quintile of the income distribution. We use this ratio to assign to each household (depending on its position in the income distribution) the average value of in-kind benefits in the baseline. In the next step, we assume that these in-kind benefits increase by a certain factor in the two shock scenarios.[27] We then recompute the income stabilization coefficients. Figure 2.7.1

[26] Another explanation would be that this is driven by discretionary policy measures, so that it would not be part of automatic stabilizers.

[27] We use a factor of 1.00459 which is derived from estimates of Darby and Melitz (2008). In Table 3, they report a coefficient of 0.0918 in a regression of the output gap on health expenditure. This coefficient is multiplied by 0.05, i.e. the percentage reduction in income in our shock scenarios.

reports the results. As expected, the income stabilization coefficients increase, but the ordering of countries is hardly affected.[28] The increase is more pronounced in countries where in-kind benefits make up a larger share of disposable income.[29] On average, income stabilization coefficients in European countries increase – in relative terms – twice as much as in the US.[30] This also implies that the calculations in the preceding sections slightly understate the EU-US stabilization gap.[31]

2.5 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 correlation between automatic stabilizers and other macro variables like e.g. openness and, finally, the association between discretionary fiscal stimulus programs and automatic stabilizers as well as openness.

2.5.1 Stabilization coefficients and macro estimates

One could argue that macro measures such as 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.

[28] The only exceptions are France and Luxembourg and Finland and the Netherlands who change the position.

[29] A comparison of Finland and the Netherlands - two countries with similar stabilization coefficients - illustrates this relationship. In Finland, the share of in-kind benefits relative to disposable income is higher in each quintile of the income distribution (cf. Table A.8 in Marical et al. (2006) who report ratios for 17 of 20 countries of our analysis). This explains why income stabilization including non-cash benefits is above the regression line (dotted line) in Finland and below in the Netherlands (see Figure 2.7.1).

[30] It would be possible to simulate different shocks (including different changes across countries), but the qualitative points made here do not change – whereas the quantitative results depend on the – arbitrary – assumption about the automatic change in in-kind benefits.

[31] We have assumed here that the relative increase in in-kind benefits is identical in all countries. If, in addition, the countercyclicality in non-cash benefits was larger in Europe than in the US, the EU-US *stabilization* gap would be even larger. But to our knowledge there is no evidence available supporting this claim.

A further widely-used macro measure for automatic stabilization is provided by the OECD (Girouard and André (2005)) who estimate semi-elasticities measuring the overall cyclical sensitivity of the budget. It summarizes reduced-form estimates for four revenue (corporate tax, personal tax, indirect tax, social security contributions) and one expenditure item (unemployment compensation).[32]

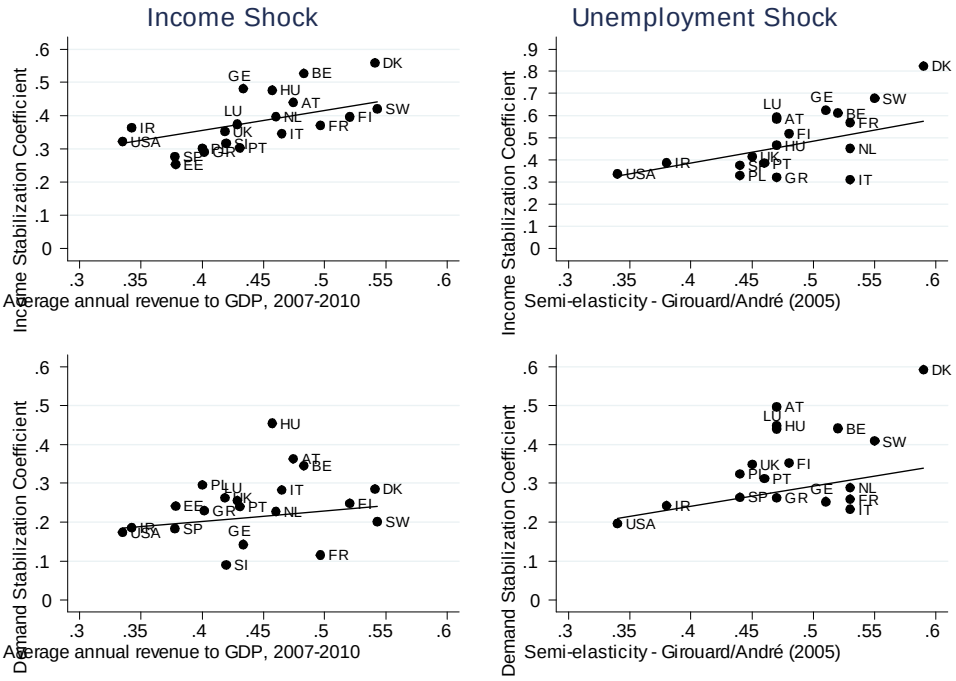
The left panel of Figure 2.5.1 depicts the relation between the ratio of average revenue to GDP for the period 2007-2010 and the income (demand) stabilization coefficients for the proportional income shock in the upper (lower) left panel, whereas the right panel shows the corresponding relations between the stabilization coefficients for the unemployment shock with the semi-elasticities taken from Girouard and André (2005).[33] With a correlation of 0.58 for the income shock, 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. As shown in Figure 2.5.1 (lower left panel), with a coefficient of 0.26 government size and stabilization of aggregate household demand (Zeldes criterion) are only weakly correlated. Another interesting point arises from Figure 2.5.1 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 is important for its automatic stabilization effects.

The correlations between income and demand stabilization coefficients for the unemployment shock and macro measures for automatic stabilization are higher. This is confirmed in the right panel of Figure 2.5.1 for the semi-elasticities and

[32] It is calculated by combining elasticities of tax receipts and expenditures with respect to their bases with elasticities of tax and expenditure bases with respect to cyclical indicators. The former elasticity estimates are based on information regarding statutory tax rates and the income distribution while the latter estimates are regression-based.

[33] 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 for the size of the government.

Figure 2.5.1: Government size and stabilization coefficients



Source: Own calculations based on EUROMOD and TAXSIM, European Commission (2009a), Girouard and André (2005).

in Table 2.7.7 in the Appendix. Interestingly, the correlations between the macro estimates - semi-elasticities, revenue and expenditure to GDP ratios - are almost 1. Conversely, the correlations between the stabilization coefficients and each of the three macro estimates are smaller and depend on the type of shock and whether income or demand stabilization is considered.

These simple correlations suggest that macro indicators like tax revenue to GDP ratios or semi-elasticities 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 (Zeldes criterion), however, is negatively correlated with the size of government. In our analysis, we find a correlation of -0.25 (Figure 2.7.2

in the Appendix).

EU-US stabilization gap How do micro and macro estimates compare with respect to the EU-US stabilization gap? Figure 2.7.3 in the Appendix shows that in the case of the proportional income shock our baseline micro estimates of the EU-US gap (the EU-US difference in the income and demand stabilization coefficients based on financial wealth and survey evidence shown in the upper three lines and expressed in percentage points) are smaller than the gap predicted by the macro measures, but are of similar magnitude in case of the unemployment shock. The gap is smallest for the demand stabilization coefficients, in particular the one which is based on survey evidence, and it increases when we turn to the income stabilization coefficients. Compared with the income shock, the EU-US gap in terms of income stabilization is approximately twice as large for the unemployment shock.

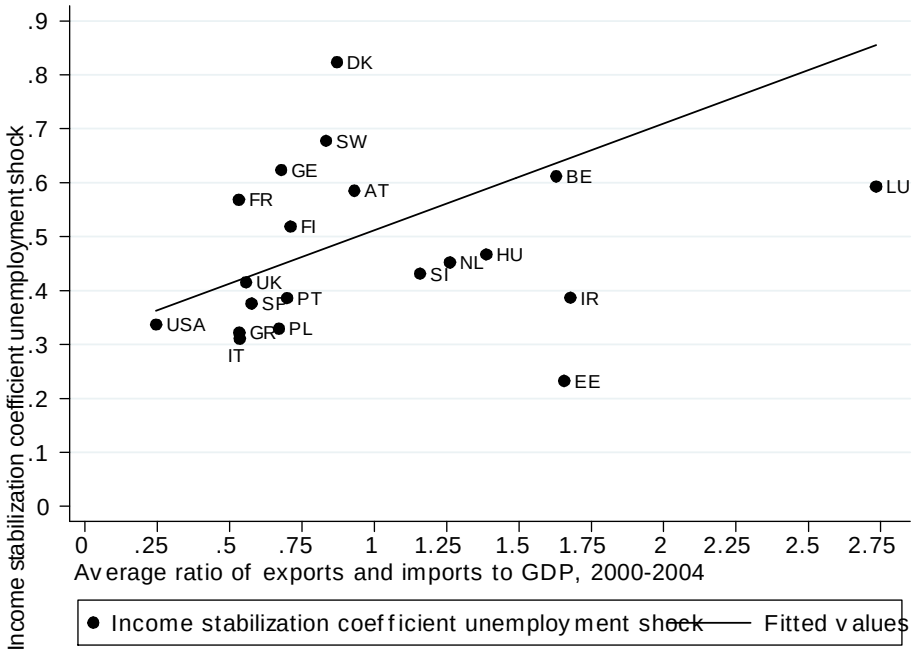
The inclusion of employer social insurance contributions and consumption taxes into our micro measures (lower two lines for income and unemployment shock) leads to an increase in the EU-US gap for both types of shocks, but does not change the conclusion that the gap is larger for the unemployment shock. Our results thus demonstrate that EU-US comparisons of automatic stabilizers crucially depend both on the type of macro shock that hits the economy and whether income or demand stabilization is considered. These differentiated results cannot be achieved with conventional macro estimates for automatic stabilization.

2.5.2 Automatic stabilizers and openness

Our results show 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 might also have other reasons. In particular, the effectiveness of demand stabilization as a way of sta-

Figure 2.5.2: Income stabilization coefficient and openness of the economy



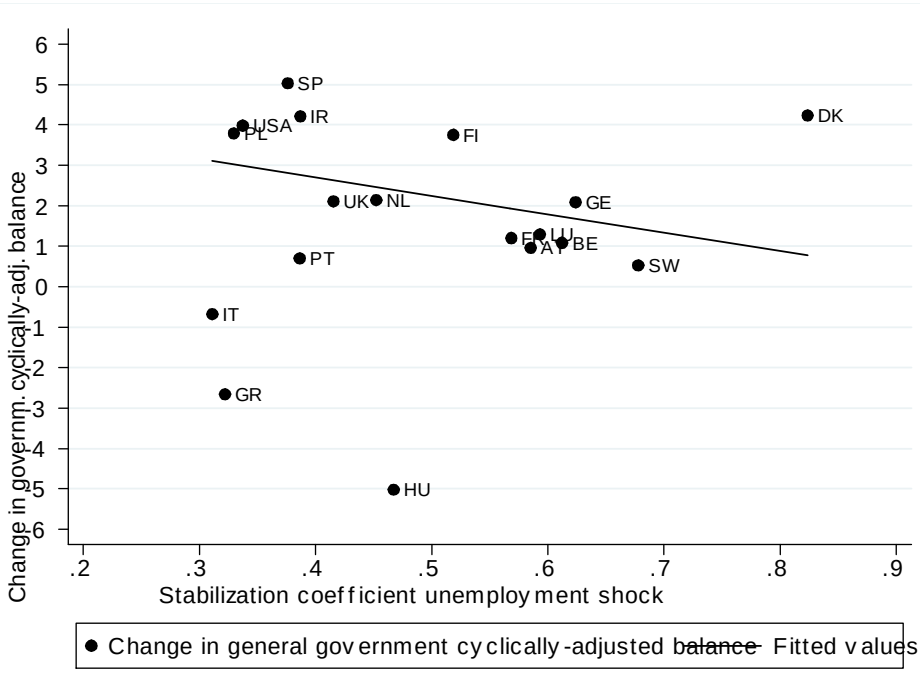
Source: Own calculations based on EUROMOD and TAXSIM, Heston, Summers and Aten (2006).

bilizing 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 2.5.2 depicts the relationship between income stabilization coefficients for the unemployment shock and openness as measured by the ratio of exports plus imports over GDP. As Figure 2.5.2 shows, it is not the case that more open economies have weaker automatic stabilizers, the correlation is even positive (0.51). Our results thus support the hypothesis of Rodrik (1998) that income stabilization is higher in more open economies. For the income stabilization coefficients of the income shock and the demand stabilization coefficients, we find similar correlations.

2.5.3 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 - the change in the general government structural balance from 2007 to 2008-11 - as measured by the OECD (2010) to stabilization coefficients.

Figure 2.5.3: Discretionary measures and income stabilization coefficient



Source: Own calculations based on EUROMOD and TAXSIM, OECD (2010). Notes: General government cyclically-adjusted balance in per cent of potential GDP.

Figure 2.5.3 shows that income stabilization coefficients (for the unemployment

shock) are negatively correlated to the size of fiscal stimulus programs (-0.28).[34] The same holds for the income stabilization coefficients of the income shock, demand stabilization coefficients (see Figure 2.7.4 in the Appendix) or - with a larger negative correlation - for the macro measures of automatic stabilization discussed in Section 2.5.1.

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 idea behind this argument was that some countries might show a free-rider behavior and profit from spill-over effects of discretionary measures.[35] Therefore, we ask whether more open countries which are supposed to benefit more from spill-over effects indeed passed smaller stimulus programs. We find a negative correlation of -0.49 between discretionary measures and the coefficient for openness. This supports the hypothesis (cf. Figure 2.7.5 in the Appendix), but one should bear in mind that these simple correlations do not reveal anything about causality.

2.6 Conclusions

In this paper we have used 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.

[34] The correlation slightly increases if Hungary which experienced a fiscal tightening between 2007 and 2008-11 is dropped from the sample.

[35] 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.

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. This result implies that European welfare states provide higher insurance against idiosyncratic shocks than the US does. In addition, our analysis shows that the results for the proportional income shock do not differ much to a proportional income increase (results available from the authors upon request). Hence, the difference between the income shock and the unemployment shock can also be interpreted as the different size of automatic stabilization in good and bad times.

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 proportional income shock, the cushioning effect of automatic stabilizers ranges from 4-22% in the EU. For the US, we find values between 6-17%, 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 13-30% whereas the values for the US (7-20%) 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 poli-

cymakers to overestimate the effect of automatic stabilizers.

A third important result 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 a weak negative correlation between fiscal stimulus programs of individual countries and stabilization coefficients. Moreover, 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 recent 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, our analysis is purely positive. We abstract from normative welfare considerations about the optimal size of automatic stabilization. Taxes are distortionary and hence imply a trade-off between insurance against shocks through

redistribution and efficiency considerations. 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.

2.7 Appendix

2.7.1 Additional results

Table 2.7.1: Decomposition income stabilization coefficient for income shock

	FEDTax	StateTax	SIC	BEN	Total
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 2.7.2: Decomposition income stabilization coefficient for unemployment shock

	FEDTax	StateTax	SIC	BEN	Total
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 2.7.3: Shares of liquidity constrained households

	Population share			Income share		
	Wealth	Home	Survey	Wealth	Home	Survey
AT	0.844	0.481	0.302	0.827	0.401	0.088
BE	0.702	0.297	0.228	0.633	0.177	0.039
DK	0.581	0.432	0.218	0.516	0.238	0.039
EE	0.975	0.158	0.264	0.955	0.121	0.028
FI	0.696	0.356	0.334	0.585	0.235	0.089
FR	0.365	0.452	0.340	0.296	0.374	0.120
GE	0.328	0.593	0.392	0.287	0.494	0.159
GR	0.845	0.260	0.318	0.808	0.282	0.053
HU	0.973	0.073	0.620	0.958	0.073	0.282
IR	0.663	0.176	0.396	0.538	0.102	0.091
IT	0.762	0.235	0.330	0.733	0.191	0.076
LU	0.708	0.307	0.210	0.692	0.309	0.066
NL	0.637	0.451	0.240	0.570	0.247	0.058
PL	0.985	0.463	0.560	0.982	0.434	0.192
PT	0.861	0.334	0.215	0.800	0.261	0.023
SI	0.661	0.103	0.440	0.522	0.080	0.108
SP	0.709	0.180	0.306	0.681	0.151	0.066
SW	0.528	0.674	0.201	0.472	0.752	0.062
UK	0.793	0.320	0.263	0.735	0.164	0.062
EU	0.641	0.383	0.346	0.596	0.305	0.106
EURO	0.561	0.387	0.333	0.513	0.313	0.101
USA	0.743	0.369	0.269	0.486	0.173	0.168

Source: Own calculations based on EUROMOD and TAXSIM. Notes: 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) and the third refers to survey evidence.

Table 2.7.4: Decomposition income stabilization coefficient 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 2.7.5: Demand stabilization coefficient 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

Table 2.7.6: Decomposition of income stabilization coefficient for the income shock into tax benefit system (column) and population characteristics (row)

	AT	BE	DK	EE	FI	FR	GE	GR	HU	IR	IT	LU	NL	PL	PT	SI	SP	SW	UK	USA
AT	0.439	0.528	0.562	0.253	0.401	0.370	0.477	0.284	0.477	0.361	0.360	0.376	0.393	0.330	0.327	0.316	0.283	0.407	0.355	0.304
BE	0.442	0.527	0.560	0.256	0.378	0.360	0.468	0.275	0.462	0.350	0.360	0.360	0.389	0.316	0.311	0.299	0.279	0.387	0.355	0.296
DK	0.437	0.531	0.558	0.252	0.415	0.373	0.482	0.282	0.474	0.363	0.368	0.373	0.394	0.337	0.330	0.316	0.280	0.418	0.358	0.313
EE	0.441	0.524	0.571	0.253	0.408	0.383	0.487	0.298	0.478	0.375	0.352	0.395	0.399	0.331	0.356	0.336	0.297	0.426	0.352	0.320
FI	0.426	0.523	0.565	0.255	0.396	0.377	0.475	0.275	0.479	0.361	0.354	0.387	0.394	0.321	0.324	0.323	0.275	0.404	0.353	0.306
FR	0.437	0.526	0.564	0.253	0.403	0.370	0.482	0.288	0.474	0.365	0.358	0.379	0.395	0.327	0.336	0.323	0.287	0.414	0.354	0.311
GE	0.441	0.525	0.570	0.252	0.407	0.377	0.481	0.299	0.479	0.373	0.351	0.390	0.398	0.336	0.349	0.333	0.295	0.422	0.352	0.312
GR	0.449	0.521	0.575	0.261	0.340	0.390	0.461	0.291	0.504	0.365	0.351	0.400	0.411	0.296	0.326	0.343	0.289	0.370	0.359	0.306
HU	0.441	0.525	0.563	0.257	0.389	0.376	0.478	0.275	0.476	0.358	0.353	0.380	0.393	0.316	0.321	0.320	0.282	0.402	0.357	0.305
IR	0.436	0.524	0.564	0.257	0.369	0.394	0.476	0.279	0.477	0.363	0.358	0.394	0.411	0.302	0.327	0.347	0.276	0.393	0.362	0.312
IT	0.434	0.524	0.565	0.260	0.351	0.382	0.470	0.276	0.483	0.354	0.346	0.390	0.408	0.279	0.305	0.350	0.276	0.375	0.357	0.300
LU	0.434	0.527	0.562	0.251	0.409	0.369	0.487	0.288	0.463	0.365	0.364	0.374	0.396	0.330	0.336	0.323	0.284	0.418	0.356	0.312
NL	0.438	0.529	0.561	0.252	0.419	0.374	0.485	0.291	0.475	0.367	0.365	0.377	0.397	0.338	0.339	0.323	0.286	0.424	0.357	0.310
PL	0.437	0.528	0.565	0.257	0.376	0.380	0.474	0.282	0.485	0.360	0.357	0.384	0.406	0.301	0.323	0.338	0.280	0.391	0.357	0.309
PT	0.437	0.532	0.564	0.261	0.354	0.393	0.467	0.278	0.477	0.347	0.353	0.382	0.415	0.277	0.303	0.359	0.270	0.378	0.365	0.308
SI	0.438	0.527	0.561	0.254	0.403	0.372	0.482	0.278	0.468	0.360	0.358	0.376	0.391	0.325	0.327	0.317	0.283	0.413	0.356	0.302
SP	0.431	0.531	0.563	0.252	0.397	0.391	0.482	0.286	0.465	0.366	0.358	0.387	0.406	0.321	0.338	0.344	0.277	0.413	0.361	0.308
SW	0.438	0.528	0.560	0.251	0.417	0.373	0.489	0.282	0.463	0.363	0.359	0.378	0.386	0.339	0.335	0.319	0.285	0.420	0.354	0.313
UK	0.443	0.523	0.570	0.255	0.403	0.378	0.481	0.295	0.482	0.372	0.352	0.393	0.400	0.329	0.347	0.334	0.296	0.419	0.352	0.316
USA	0.435	0.538	0.558	0.257	0.441	0.418	0.502	0.304	0.457	0.377	0.361	0.389	0.414	0.329	0.360	0.332	0.284	0.447	0.359	0.322

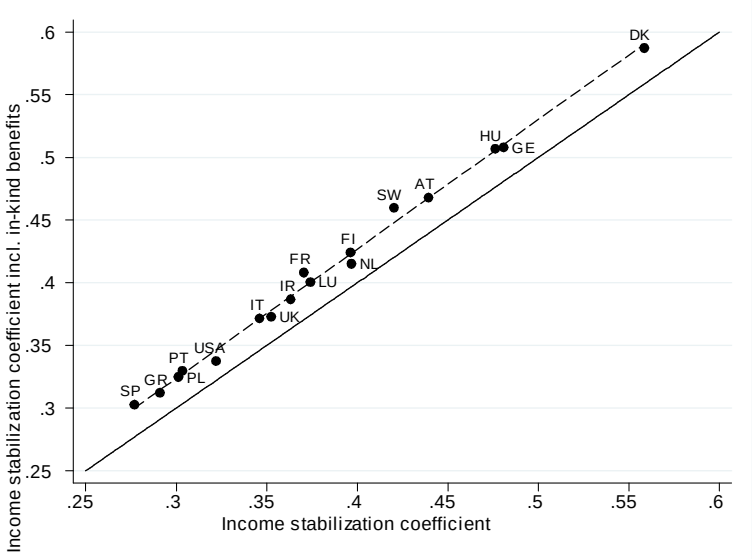
Source: Own calculations based on EUROMOD and TAXSIM. Notes: Each row shows the income stabilization coefficients for the income shock calculated with demographic characteristics of a certain country but varying tax and transfer systems, whereas each column shows the results under a fixed tax and transfer system of a certain country, but varying population characteristics. The main diagonal shows the original income stabilization coefficients as reported in Figure 2.4.2.

Table 2.7.7: Correlation between micro and macro estimates

	Semi-Ela	Rev/GDP	Exp/GDP
$\tau^I IS$	0.60	0.58	0.51
$\tau^I US$	0.67	0.69	0.64
$\tau_1^C IS$	0.22	0.26	0.25
$\tau_2^C IS$	0.59	0.55	0.46
$\tau_3^C IS$	-0.24	-0.24	-0.27
$\tau_1^C US$	0.57	0.65	0.64
$\tau_2^C US$	0.55	0.56	0.52
$\tau_3^C US$	0.51	0.49	0.48
Semi-Ela	1		
Rev/GDP	0.96	1	
Exp/GDP	0.91	0.97	1

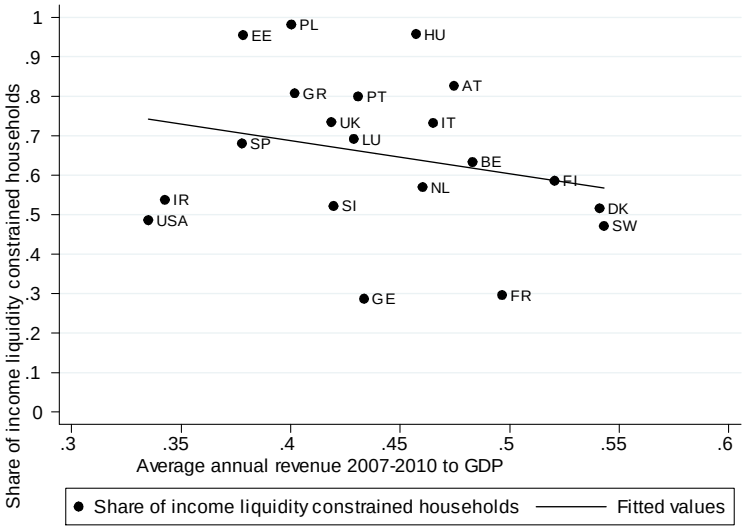
Source: Own calculations based on EUROMOD and TAXSIM, Girouard and André (2005), European Commission (2009). Notes: τ^C: demand stabilization coefficient, τ^I : income stabilization coefficient, IS: income shock, US: unemployment shock. The first approach for the identification of liquidity constraints refers to the financial wealth criterion (Zeldes), the second to the real estate property criterion (Runkle) and the third refers to survey evidence.

Figure 2.7.1: Income stabilization incl. in-kind benefits



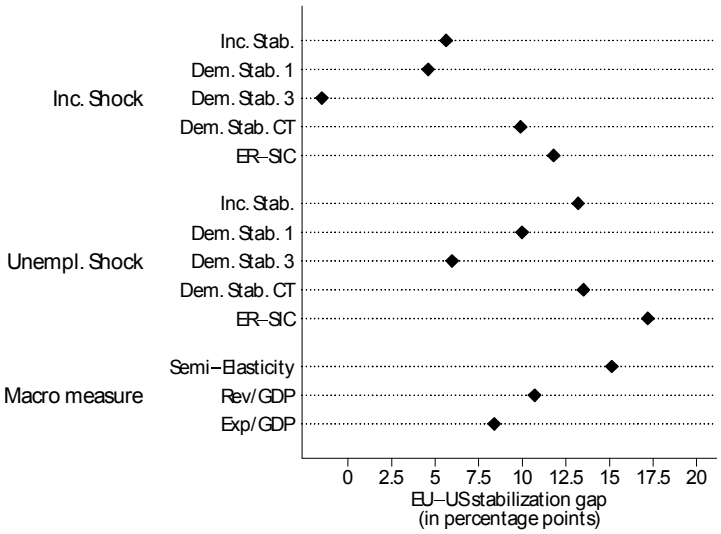
Source: Own calculations based on EUROMOD and TAXSIM.

Figure 2.7.2: Income share of liquidity constrained households and government revenue



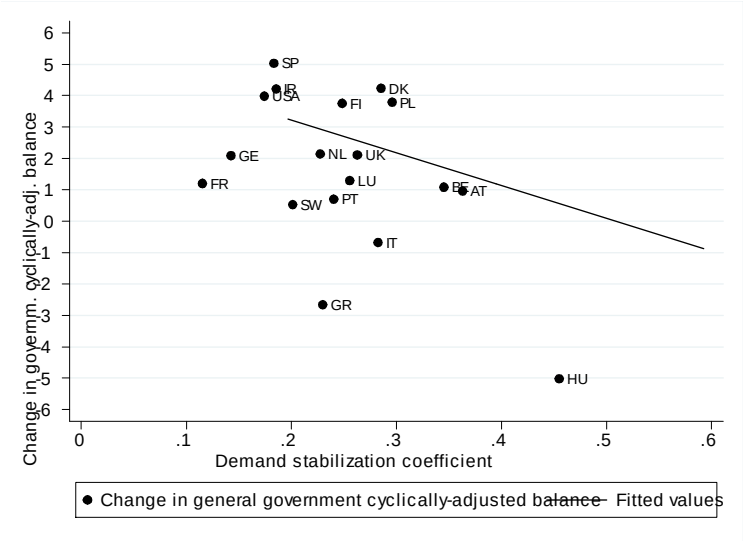
Source: Own calculations based on EUROMOD and TAXSIM, European Commission (2009a).

Figure 2.7.3: EU-US stabilization gap



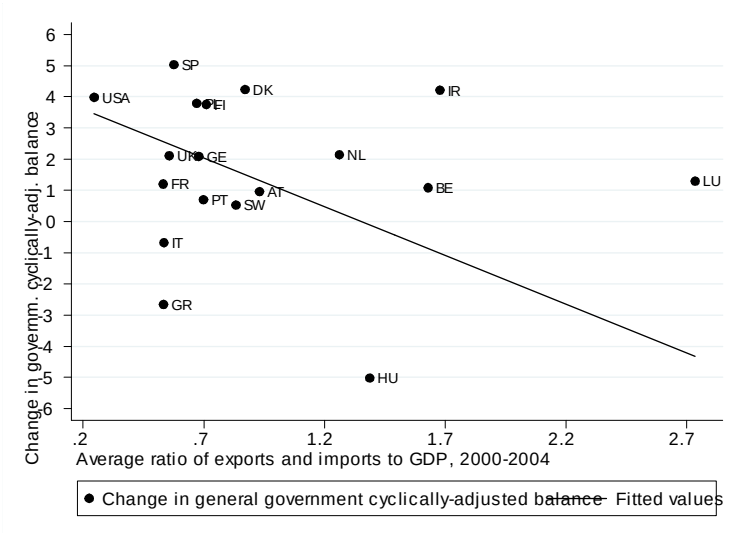
Source: Own calculations based on EUROMOD and TAXSIM, European Commission (2009a), Girouard and André (2005). Notes: Dem. Stab. 1: financial wealth criterion, Dem. Stab. 3: survey evidence, Dem. Stab. CT: incl. consumption taxes, In-kind: Inc. stab. incl. in-kind benefits, ER-SIC: Inc. stab. incl. employer contributions.

Figure 2.7.4: Discretionary measures and demand stabilization



Source: Own calculations based on EUROMOD and TAXSIM, OECD (2010). Notes: General government cyclically-adjusted balance in per cent of potential GDP.

Figure 2.7.5: Discretionary measures and openness of the economy



Source: Heston et al. (2006) and OECD (2010). Notes: General government cyclically-adjusted balance in per cent of potential GDP.

2.7.2 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.

Chapter 3

Automatic stabilizers, economic crisis and income distribution in Europe

3.1 Introduction

Throughout Europe, the current economic and financial crisis has had a severe impact on incomes and employment. While the magnitude of the shocks is usually measured at the macro level, the resulting welfare effects depend not only on the total size of losses but also on their distribution across different groups of society and the cushioning effect of the tax benefit system. This chapter investigates to what extent the tax and transfer system protects households at different income levels and in different European countries against income losses and unemployment.[1] As micro data for an ex-post distributional analysis of the current crisis will only become available after a considerable time lag, it is interesting to explore the effects of stylized shocks on the income distribution ex-ante in order to assess the likely distribution of changes in market income and how they translate to changes in disposable income. While this is not a forecasting exercise, our approach does help to understand potential distributional implications of the current economic crisis.

[1] This section is based on Dolls, Fuest and Peichl (2011).

What can we learn from past recessions in terms of distributional consequences? Heathcote et al. (2010) refer to the period from 1967-2006 and show for the US that low income households suffer the largest earnings declines in recessions. Households from top percentiles are much less affected which in turn leads to an increase in earnings equality. However, inequality in disposable income rises less than earnings inequality since government transfers, which constitute a large part of disposable income for households at the bottom of the earnings distribution, partly offset income losses. The cushioning role of the government in mitigating increases in earnings inequality can be substantial as is shown by Domeij and Floden (2010) for Sweden, a country with a larger government compared to the US. In Sweden's severe 1992 recession, earnings inequality increased dramatically whereas inequality in disposable income almost remained at its before-crisis level.

Given the experience from past recessions, the question is whether the current economic crisis will have similar distributional consequences. Heathcote et al. (2010), who use the latest US data, show that inequality in disposable income went up slightly in 2008. However, data for 2009 are not available yet, so it is too early for an overall ex-post evaluation of the current crisis. Other simulation studies provide a range of scenarios to assess likely distributional effects. Bargain, Immvervoll, Peichl and Siegloch (2012) use matched employer-employee data to estimate labor demand in Germany and predict employment effects in response to output shocks. They find that low-skilled and part-time/irregular workers face higher risks of employment cuts. In some sectors, but not on average, the same is true for younger and older workers. Callan, Nolan and Walsh (2011) analyze the distributional impact of recent public sector pay cuts in Ireland and conclude that they have an immediate inequality reducing effect, though further conclusions depend on the specific implementation.

It is the purpose of this paper to analyze the effects of macro shocks on the income distribution and the role of the tax benefit system to cushion these impacts. We focus on 19 European countries for which a European multi-country microsimulation model is available (EUROMOD). We run two controlled experiments of macro shocks to income and employment in a common microeconometric framework. The first shock is a proportional decline in household gross income by five per cent (income shock). This is the usual way of modeling shocks in simulation

studies analyzing automatic stabilizers (Auerbach and Feenberg (2000), Mabbett and Schelkle (2007), Dolls et al. (2012)). But 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 the unemployment rate increases such that total household income decreases by 5% (unemployment shock).

It is important to note that all income sources from market activity (labor, business, capital, property and other income) are reduced by the same proportion. In principle, it would be possible to design scenarios which take into account the observed change in different income sources in the different countries to construct country specific scenarios. However, as we do not aim at conducting an ex-post analysis of the actual development during the recent crisis but rather want to analyze stylized scenarios which are comparable across countries, we refrain from simulating country specific scenarios. How would results change if the different income sources were affected asymmetrically? In the hypothetical case that, e.g. capital income, went down substantially, whereas one other income source, say labor income, did not change at all while the total income loss were equal to the scenario with a proportional reduction of all income sources by 5 per cent, stabilization results would differ depending on the tax rates levied on capital and labor income. If capital income were taxed with a lower rate than labor income, automatic stabilization would be lower in this case. Furthermore, as capital incomes are concentrated more on the top of the income distribution, a decrease of capital incomes would, ceteris paribus, reduce income inequality.

For both scenarios, we compute measures of inequality, poverty and richness to assess the distributional impact of the macro shocks. This analysis enables us to explore diverse effects of the shock scenarios. Further on, we identify how much weight existing pre-crisis tax benefit systems put on different income groups to protect them from income losses. In the next step, we compare the effects across countries in order to evaluate the cushioning effect of different welfare state regimes and to cluster the countries according to their stabilizing effect on the income distribution.

We find that the proportional income shock leads to a reduction in inequal-

ity whereas distributional implications of the asymmetric unemployment shock crucially depend on which income groups are affected by rising unemployment. Both shocks increase the headcount ratio for poverty and decrease the counterpart for richness. Turning next to subgroup decompositions, we conclude that European tax benefit systems place unequal weights on the extent how different income groups are protected. In case of the unemployment shock, some Eastern and Southern European countries provide little income stabilization for low income groups whereas the opposite is true for the majority of Nordic and continental European countries. With respect to the relationship between income stabilization and redistribution, we find that tax benefit systems with high build-in automatic stabilizers are also those which are more effective in mitigating existing inequalities in market income.

The paper is structured as follows. In Section 3.2, we provide an institutional overview of tax and transfer systems in Europe and briefly show empirical evidence on pre- and post-tax inequality in European countries as was the case before the start of the current economic crisis. Section 3.3 presents the results of the distributional analysis and Section 4.5 concludes.

3.2 Tax and transfer systems in Europe

3.2.1 Tax benefit systems

The existing income tax systems in the 19 European countries under consideration offer considerable variety. As Table 3.2.1 shows, all Western European countries in our sample have graduated rate schedules with a number of brackets ranging from 2 (Ireland) to 16 (Luxembourg), with the top marginal income tax rate ranging from 38% (Luxembourg) to 59% in Denmark. There are also considerable differences across the Eastern European countries. Estonia has a flat tax system, with a single rate of 22% and a basic allowance of 1.304 Euro, while the other Eastern European countries in our sample apply graduated tax sched-

ules with a comparatively small number of brackets (2-3) and relatively low top marginal rates. Interestingly, Slovenia and Poland have very similar income tax schedules as the Western European countries, with highest rates around 40%, but with a lower amount belonging to the 0% bracket.

Table 3.2.1: Income tax systems 2007

	No of brackets	Lowest rate	Highest rate	Form of main tax relief
AT	4	38.3%	50.0%	0% bracket (10,000 EUR)
BE	5	25.0%	50.0%	tax allowance (6,040 EUR)
DK	3	state 5.48%. local 24.6%	state 15%. local 24.6%	tax allowance
EE	flat tax	22.0%	22.0%	basic allowance 1,304 EUR
FI	4	state 8.5%. local 16%	state 31.5%. local 21%	0% bracket (12,600 EUR). state tax allowance. local
FR	4	5.5%	40.0%	0% bracket (5,614 EUR)
GE	formula	15.8%	44.3%	0% bracket (7,664 EUR)
GR	3	15.0%	40.0%	0% bracket (12,000 EUR)
HU	2	18.0%	36.0%	tax credit
IR	2	20.0%	41.0%	tax allowance
IT	5	23.0%	43.0%	tax credit
LU	16	8.0%	38.0%	0% bracket (10,335 EUR)
NL	4	33.6%	52.0%	tax credit
PL	3	19.0%	40.0%	0% bracket (3,091 EUR)
PT	6	10.5%	40.0%	tax credit
SI	3	16.0%	41.0%	tax allowance (2,800 EUR)
SP	4	24.0%	43.0%	tax allowance (5,151 EUR)
SW	2	state 20%. local 31.6%	state 25%. local 31.6%	tax allowance
UK	3	10.0%	40.0%	tax allowance (5,225 EUR)

Source: Eurostat.

European countries do not only differ in their income tax schedules but also in the design of their system of social protection and redistribution. In each country, direct and indirect taxes as well as social insurance contributions (SIC) are used to finance the welfare state (see Table 3.2.2 for an overview). The weight in the tax mix of these components depends on the structural design of the tax benefit system in each country. For the Continental countries it is evident that the SIC

are more important to finance the welfare state than the direct taxes. This is also true for Eastern Europe, while in the Nordic countries the SIC play only a minor role. Denmark relies almost exclusively on taxes for financing the welfare state. In Southern European countries, indirect taxes tend to play the most important role. This is even more true for Eastern Europe. With few exceptions, there is a north-to-south and west-to-east decline with respect to the ratio of direct taxes and social insurance contributions to indirect taxes. The level of social protection (in terms of expenditures as % of GDP) is high in Nordic and Continental countries (an exception is Luxembourg) and particularly low in Eastern Europe as well as Ireland. A perhaps trivial but still interesting observation from Table 2 is that the level of social expenditures is correlated with the level of taxes and contributions.

Table 3.2.2: Tax benefit mix (as % of GDP) in 2005

	Total Taxes	Indirect Taxes	Direct Taxes	Social Contr.	Dir. Taxes+SIC /Ind. Taxes	Social Expen.
AT	42.0	14.7	12.9	14.5	1.9	28.8
BE	45.5	13.9	17.8	13.9	2.3	29.7
DK	50.3	17.9	31.4	1.1	1.8	30.1
EE	30.9	13.5	7.1	10.4	1.3	12.5
FI	43.9	14.1	17.9	12.0	2.1	26.7
FR	44.0	15.8	11.9	16.4	1.8	31.5
GE	38.8	12.1	10.3	16.3	2.2	29.4
GR	34.4	12.9	9.5	12.1	1.7	24.2
HU	38.5	15.8	9.1	13.6	1.4	21.9
IR	30.8	13.6	12.4	4.8	1.3	18.2
IT	40.6	14.5	13.5	12.6	1.8	26.4
LU	38.2	13.4	14.1	10.7	1.9	21.9
NL	38.2	13.1	11.9	13.1	1.9	28.2
PL	34.2	13.9	7.0	13.7	1.5	19.6
PT	35.3	15.3	8.6*	11.3	1.3	24.7*
SI	40.5	16.4	9.3	14.8	1.5	23.4
SP	35.6	12.5	11.4	12.2	1.9	20.8
SW	51.3	17.3	20.1	13.8	2.0	32.0
UK	37.0	13.3	16.8	6.9	1.8	26.8

Source: Eurostat. Notes: * Numbers for Portugal are from 2004

3.2.2 Distribution and Redistribution

How do European countries differ in terms of pre-tax and post-tax inequality? The first column of Table 3.2.3 indicates that inequality in market income, Y_i^M, as measured by the Gini coefficient, displays huge disparities among the European countries of our sample. Coefficients range from 0.39 to 0.55, with values above 0.5 in some Southern and Eastern European countries (Estonia, Greece, Hungary, Poland, Portugal and Slovenia). At the lower end, the Netherlands is the only country with a Gini coefficient for equivalent market income which is below 0.4. Closest to the Netherlands are Sweden and Austria, both with values below 0.45.

Column 2 shows that post-tax inequality, i.e. the Gini coefficient based on disposable income, is substantially lower than pre-tax inequality in all countries. Thus, existing inequalities in market income are mitigated by European tax benefit systems through a substantial degree of redistribution. Although there are significant differences in the size of redistribution, the overall inequality ranking of the countries basically remains the same.

Finally, the last two columns of Table 3.2.3 show the absolute and relative differences between the pre- and post-tax Gini coefficients as measures of redistribution (see also Fuest, Niehues and Peichl (2010)). In countries such as Austria, Belgium, Denmark, Hungary or Luxembourg, tax benefit systems reduce inequalities in market income by almost 50%. At the other end of the spectrum, we find lowest redistribution in Portugal and Italy with a reduction in inequality of approximately 30%.

Table 3.2.3: Distribution and redistribution in the baseline

	$G_B^{Y^M}$	$G_B^{Y^D}$	$\Delta G_B^{Y^D-Y^M}$	$\Delta\%G_B^{Y^D-Y^M}$
AT	0.441	0.227	-0.214	-48.569
BE	0.491	0.247	-0.244	-49.704
DK	0.457	0.232	-0.226	-49.344
EE	0.509	0.324	-0.185	-36.403
FI	0.484	0.269	-0.215	-44.464
FR	0.487	0.260	-0.226	-46.523
GE	0.494	0.268	-0.225	-45.667
GR	0.502	0.323	-0.179	-35.590
HU	0.547	0.274	-0.273	-49.885
IR	0.459	0.309	-0.150	-32.642
IT	0.498	0.348	-0.149	-30.024
LU	0.472	0.243	-0.229	-48.459
NL	0.386	0.247	-0.139	-35.902
PL	0.545	0.332	-0.213	-39.102
PT	0.507	0.361	-0.146	-28.784
SI	0.504	0.270	-0.234	-46.353
SP	0.467	0.294	-0.172	-36.924
SW	0.437	0.234	-0.203	-46.523
UK	0.496	0.306	-0.190	-38.353

Source: Own calculations based on EUROMOD.

3.3 Effects of shocks on income distribution

3.3.1 Overall distribution

What are the distributional consequences of the two macro shocks described above? Table 3.3.1 shows the percentage changes in the Gini coefficient and in the headcount ratios for being poor or rich, all based on equivalent disposable income.

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[2] 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.[3] 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 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.

What is the effect of the two shock scenarios on market income inequality and the amount of redistribution achieved by the tax and transfer system? Table 3.3.2 sheds further light on the implications for the overall income distribution. The first column shows the percentage change of the Gini coefficient based on equivalent market income between the unemployment shock scenario and the baseline $((G_{US}^{Y^M} - G_B^{Y^M})/G_B^{Y^M})$.[4] With the exception of Portugal, we find an increase in inequality which is highest in Ireland, Denmark, the UK and Sweden (all > 2%)

[2] People are classified as poor (rich) if their equivalent disposable income is less than 60% (more than twice) the median equivalent disposable income in the population.

[3] 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. A more in-depth description of the approach can be found in the Appendix.

[4] Note that the Gini coefficient of market income does not change in case of the proportional shock.

Table 3.3.1: Effect of shocks on income distribution

	Income shock			Unemployment shock		
	Gini	Poor	Rich	Gini	Poor	Rich
AT	-1.297	4.760	-12.088	0.304	4.421	-3.619
BE	-2.270	2.673	-16.241	0.126	3.869	-4.322
DK	-2.064	3.838	-18.903	-0.218	1.176	-5.054
EE	-1.622	4.529	-11.508	0.914	6.542	-2.989
FI	-1.806	5.622	-13.981	0.347	7.104	-3.428
FR	-1.422	7.458	-9.947	0.210	4.083	-2.409
GE	-1.489	4.141	-12.982	0.445	6.245	-3.469
GR	-0.338	7.288	-11.355	0.166	2.509	-2.820
HU	-0.604	5.701	-9.241	0.518	5.612	-3.861
IR	-1.335	3.701	-12.591	1.154	10.295	-7.285
IT	-0.735	4.910	-5.857	0.507	3.567	-2.234
LU	-1.233	9.994	-14.276	-0.225	1.335	-3.843
NL	-1.232	10.629	-16.256	0.652	7.892	-3.985
PL	-0.923	6.749	-9.692	0.281	3.757	-2.639
PT	-0.611	4.693	-6.055	-0.709	1.528	-2.667
SI	-0.318	0.273	-1.290	0.327	4.354	-2.931
SP	-0.693	6.343	-13.806	0.590	3.545	-3.003
SW	-2.050	4.215	-15.446	-0.154	3.444	-3.774
UK	-2.219	3.753	-13.001	1.074	7.895	-2.873

Source: Own calculations based on EUROMOD.

and lowest in Greece, Hungary, Italy, Poland and Slovenia (all $< 1\%$).

The last two columns of Table 3.3.2 show how the difference between the Gini coefficients based on equivalent disposable and market income has changed comparing the income shock and the base scenario (column 3) and the unemployment shock and the base scenario (column 4), respectively $((G^{Y^D}_{Shock} - G^{Y^M}_{Shock}) - (G^{Y^D}_{B} - G^{Y^M}_{B}))$. The negative values indicate that both shocks lead to higher differences between the Gini coefficients based on equivalent disposable and market income. One conclusion of this finding is that post-shock inequalities in market income are even more reduced than in the base scenario, i.e. the automatic stabilizers increase the redistributive effects of the tax benefit systems in all countries in both scenarios.

Table 3.3.2: Change in distribution and redistribution

	$\Delta\%G^{Y^M}_{US-B}$	$\Delta(G^{Y^D}-G^{Y^M})_{IS-B}$	$\Delta(G^{Y^D}-G^{Y^M})_{US-B}$
AT	1.564	-0.003	-0.006
BE	1.509	-0.006	-0.007
DK	2.673	-0.005	-0.013
EE	1.347	-0.005	-0.004
FI	1.737	-0.005	-0.007
FR	1.416	-0.004	-0.006
GE	1.827	-0.004	-0.008
GR	0.632	-0.001	-0.003
HU	0.836	-0.002	-0.003
IR	3.342	-0.003	-0.012
IT	0.798	-0.003	-0.002
LU	1.022	-0.003	-0.005
NL	1.766	-0.003	-0.005
PL	0.733	-0.003	-0.003
PT	-0.353	-0.002	-0.001
SI	0.810	-0.001	-0.003
SP	1.178	-0.002	-0.004
SW	2.176	-0.005	-0.010
UK	2.204	-0.006	-0.008

Source: Own calculations based on EUROMOD.

3.3.2 Stabilization of different income groups

In this section, we refer to the income stabilization coefficient from chapter 2, but focus on the stabilization of disposable income for different income groups. The income stabilization coefficient for quantile q based on equivalent disposable income becomes:

$$\tau^I_q = 1 - \frac{\sum_{q,i}\Delta Y^D_{q,i}}{\sum_i \Delta Y^M_i} = \frac{\sum_{q,i}\left(\Delta Y^M_{q,i} - \Delta Y^D_{q,i}\right)}{\sum_i \Delta Y^M_i} = \frac{\sum_{q,i}\Delta G_{q,i}}{\sum_i \Delta Y^M_i} \tag{3.3.1}$$

Note that in the denominator, changes in market income for the total population are added up. Hence, the sum of the five quantile coefficients yields the overall income stabilization coefficient. Table 3.3.3 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 3.3.4. 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.

To further investigate which components of the tax and transfer systems drive the results for the five income quantiles, we decompose the income stabilization coefficient τ_q^I into its components income taxes, social insurance contributions (SIC) and benefits (Tables 3.5.1 and 3.5.2 in the Appendix). First, consider Table 3.5.1 for the income shock scenario. Clearly, taxes and, to a smaller extent SIC, play a large stabilizing role for higher income quantiles whereas benefits are of minor importance for these income groups. This holds for all countries in our sample. Only in France, SIC are almost as important (fifth quantile) or even more important (fourth quantile) than taxes for stabilization of disposable income which can be explained with the progressive incidence of SIC. At the bottom of the distribution, stabilization of disposable income is rather low due to smaller changes in market income.

A different picture emerges again for the unemployment shock (Table 3.5.2). In this shock scenario, benefits play an important role, especially for low income quantiles. The decomposition convincingly shows which component of the tax and transfer systems causes the difference between Southern and Eastern European countries on the one hand and its neighbors on the other. The former group of countries has a rather low level of income stabilization mainly because unemploy-

Table 3.3.3: Stabilization of income groups - Proportional Income Shock

	TAU	Q1	Q2	Q3	Q4	Q5
AT	0.439	0.023	0.045	0.072	0.107	0.192
BE	0.527	0.022	0.051	0.082	0.128	0.244
DK	0.558	0.017	0.046	0.088	0.135	0.273
EE	0.253	0.010	0.019	0.036	0.063	0.126
FI	0.396	0.010	0.031	0.063	0.099	0.192
FR	0.370	0.032	0.036	0.053	0.079	0.171
GE	0.481	0.019	0.045	0.072	0.116	0.228
GR	0.291	0.004	0.015	0.033	0.063	0.176
HU	0.476	0.029	0.041	0.056	0.097	0.254
IR	0.363	0.009	0.026	0.048	0.084	0.197
IT	0.346	0.010	0.035	0.051	0.077	0.173
LU	0.374	0.019	0.022	0.042	0.082	0.208
NL	0.397	0.020	0.040	0.062	0.093	0.182
PL	0.301	0.017	0.032	0.047	0.060	0.145
PT	0.303	0.012	0.013	0.029	0.055	0.194
SI	0.317	0.022	0.010	0.008	0.037	0.240
SP	0.277	0.006	0.020	0.036	0.062	0.153
SW	0.420	0.022	0.041	0.066	0.096	0.196
UK	0.352	0.010	0.034	0.047	0.079	0.182

Source: Own calculations based on EUROMOD.

ment benefits are substantially less generous in these countries.[5]

3.3.3 Income stabilization and redistribution

It is interesting to explore the relationship between the degree of income stabilization and redistribution which is achieved by the respective tax and transfer systems. Are systems with high automatic stabilizers also those which provide significant redistribution? To answer this question, we relate the degree of redistribution measured by the percentage difference in the Gini coefficients based

[5] Note that the income stabilization coefficients in case of the unemployment shock depend on the coverage of the newly unemployed by unemployment benefits. Stabilization might be underestimated if the newly unemployed are eligible for unemployment benefits and if the unemployed whose weights are increased through the reweighting procedure are long-term unemployed with exhausted eligibility. However, the bias might have the opposite sign if the newly unemployed are mainly not eligible for unemployment benefits (for example school leavers).

Table 3.3.4: Stabilization of income groups - Unemployment Shock

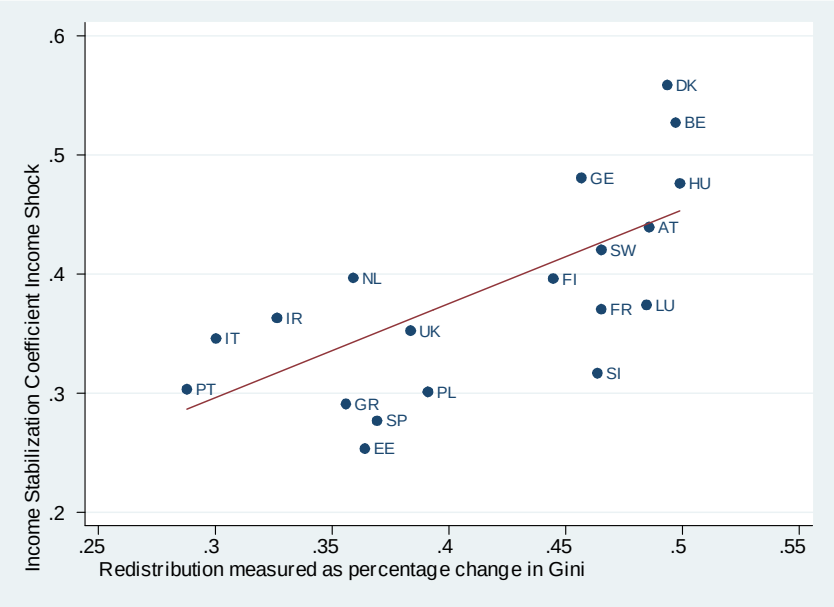
	TAU	Q1	Q2	Q3	Q4	Q5
AT	0.585	0.111	0.094	0.069	0.130	0.181
BE	0.612	0.143	0.087	0.067	0.101	0.215
DK	0.823	0.095	0.189	0.166	0.196	0.177
EE	0.233	0.062	0.019	0.019	0.041	0.091
FI	0.519	0.118	0.057	0.074	0.093	0.176
FR	0.568	0.102	0.102	0.088	0.092	0.185
GE	0.624	0.144	0.078	0.090	0.118	0.193
GR	0.322	0.016	0.031	0.040	0.071	0.164
HU	0.467	0.091	0.045	0.048	0.071	0.212
IR	0.387	0.101	0.049	0.044	0.061	0.132
IT	0.311	0.011	0.021	0.047	0.081	0.151
LU	0.593	0.148	0.177	0.056	0.070	0.142
NL	0.452	0.123	0.048	0.054	0.088	0.140
PL	0.329	0.031	0.035	0.048	0.066	0.150
PT	0.386	0.014	0.005	0.040	0.075	0.252
SI	0.431	0.045	0.038	0.056	0.083	0.210
SP	0.376	0.038	0.049	0.065	0.076	0.148
SW	0.678	0.160	0.109	0.109	0.110	0.190
UK	0.415	0.142	0.034	0.030	0.060	0.150

Source: Own calculations based on EUROMOD.

on market and disposable income to the income stabilization coefficients for the income shock (Figure 3.3.1) and the unemployment shock (Figure 3.5.1 in the Appendix). The strong relationship between income stabilization and redistribution is reflected in very high (population-weighted) correlations of 0.67 (IS) and 0.86 (US).

Next, we consider the relationship between the income stabilization coefficient and the ratio of direct to indirect taxes. We find a strong positive correlation of 0.67 (Figure 3.3.2). This is not surprising since the income stabilization coefficient positively depends on the level of direct taxes. In contrast, the mechanism how indirect taxes provide automatic stabilization is different as discussed in Dolls et al. (2012). There, we assume that only liquidity constrained households will adjust their consumption to an income shock and indirect taxes contribute to demand rather to income stabilization. We also find a positive relationship between the

Figure 3.3.1: Income Stabilization IS and Redistribution



Source: Own calculations based on EUROMOD.

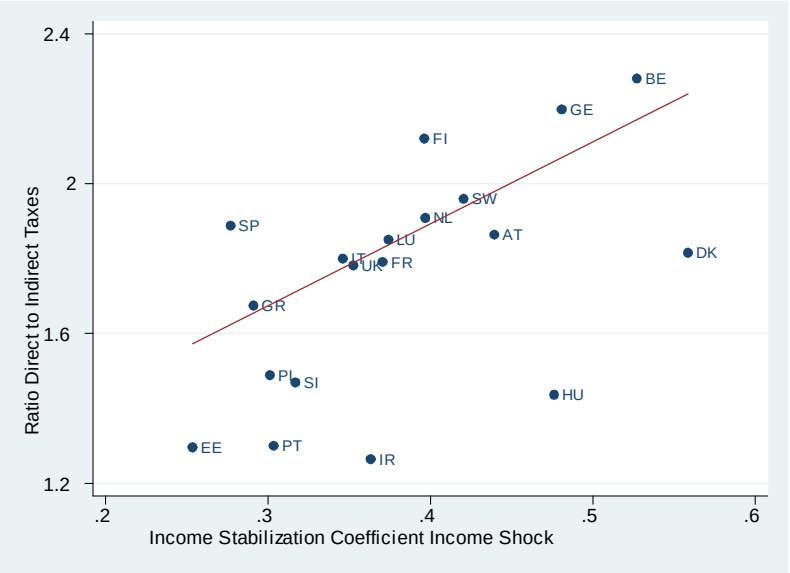
income stabilization and government size and openness of the economy[6], respectively, whereas no correlation is found between automatic stabilizers and active fiscal policy measures passed during the current economic crisis.

Table 3.3.5 shows the results of regressing the income stabilization coefficient (of the income shock) on our measure for redistribution, a measure for openness and the ratio of direct to indirect taxes. Redistribution is again measured as the percentage difference in the Gini coefficients based on market and disposable income and openness as the average ratio of exports and imports to GDP from 2000-2004.

Due to the very small sample size ($N = 19$), this inference should be interpreted with caution. Having this in mind, the significant positive relationships between automatic stabilizers and each of the variables is also confirmed by this "naïve" regression.

[6] Openness is measured as the ratio of imports and exports to GDP.

Figure 3.3.2: Income Stabilization IS and Ratio Direct to Indirect Taxes



Source: Own calculations based on EUROMOD.

3.3.4 Cluster Analysis

In order to compare the clustering of countries with respect to the different measures of automatic stabilization and controlling for several variables, we conduct a hierarchical cluster analysis to group countries that have similar characteristics across a set of variables. When performing a cluster analysis, a number of technical decisions have to be made. First, all variables have been standardized from 0 to 1 using z-scores, to prevent that the results are driven by large absolute values of some variables. Our method of grouping the countries is the common Ward's linkage, which combines such clusters which minimally increase the squared sum of errors. Our results will be illustrated in a so-called dendrogram, which graphically presents the information concerning which observations are grouped together at various levels of (dis)similarity. At the bottom of the dendrogram, each observation is considered as its own cluster. Vertical lines extend up for each observation, and at various (dis)similarity values these lines are connected to the lines from other observations with a horizontal line. The observations continue to combine, until, at the top of the dendrogram, all observations are grouped together. The height

Table 3.3.5: Regressions on income stabilization coefficient IS

dep. var.: TAU Income Shock	(1)	(2)	(3)	(4)
Redistribution	0.787***			0.441**
	(0.21)			(0.19)
Openness		0.109*		0.082*
		(0.06)		(0.04)
Ratio Direct to Indirect Taxes			0.203***	0.154***
			(0.06)	(0.05)
Constant	0.060	0.302***	0.004	-0.140
	(0.09)	(0.04)	(0.10)	(0.09)
adjusted R^2	0.417	0.114	0.410	0.651
dof	17	17	17	15
F	13.9	3.3	13.5	12.2
N	19	19	19	19

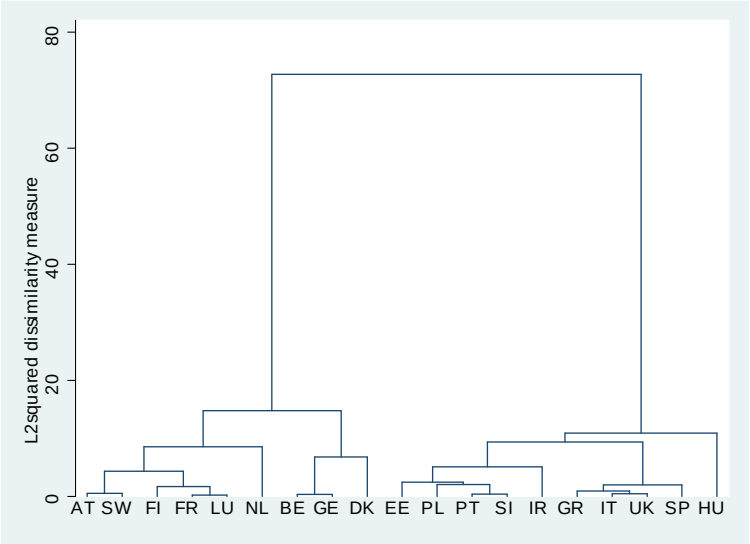
Source: Own calculations based on EUROMOD.
Note: S.E. in parentheses. Significance level: * p<0.10, ** p<0.05, *** p<0.01

of the vertical lines and the range of the (dis)similarity axis give visual clues about the strength of the clustering. In our case, the measure for the distance between cases is the common 'squared Euclidean'. Generally, long vertical lines indicate more distinct separation between groups, short lines more similarity, respectively.[7]

We perform a cluster analysis on the basis of the stabilization coefficients for the income and unemployment shock combined with inequality in market income and the ratio of direct to indirect taxes. The dendogram is illustrated in Figure 3.3.3. In accordance with the classical typology of welfare state regimes (Esping-Andersen (1990) and Ferrera (1996)), the dendogram groups Continental and Nordic countries to the left and Anglo-Saxon, Southern and Eastern European countries to the right. The former group is characterized by a rather high level of income stabilization, modest inequality in market income and an important role of direct taxes and SIC, whereas countries from the latter group tend to rank at the other end of the spectrum.

[7] Note that the general clustering results presented here are robust to different linkage or dissimilarity measure specifications. We report the results for the most common combination found in the literature.

Figure 3.3.3: Cluster Analysis



Source: Own calculations based on EUROMOD.

3.4 Conclusions

This paper investigates the extent to which the tax and transfer system mitigates negative income and employment shocks at different income levels and in different countries. We have considered the distributional consequences of two types of shocks: a proportional shock on all incomes and an increase in unemployment which affects households asymmetrically. In both scenarios, post-shock inequalities in market income are even more reduced through the tax and transfer system than in the base scenario, i.e. the redistributive effects of the tax benefit systems increase in all countries.

Further, we investigate the degree of income stabilization for different income groups. In case of the proportional income shock, stabilization for higher income groups contributes relatively more to overall stabilization than stabilization for low income groups, but this is due to the larger absolute shock on gross income for the former group. A different pattern emerges in case of the unemployment shock. With the exception of some Eastern and Southern European countries, we find relatively high income stabilization coefficients also for low income groups. The stabilization for high income groups is mainly driven by the income tax. A notable exception to this is France where (progressive) social insurance contributions are most important for stabilization. For low income groups whose tax payments are negligible, benefits play a central role. As they are more generous in the Scandinavian and Western European countries, they contribute substantially more to stabilization of disposable income for lower income groups. We thus conclude that European tax benefit systems put unequal weights on the extent different income groups are protected against macro shocks.

With respect to the relationship between income stabilization and redistribution, we find that tax benefit systems with high automatic stabilizers are also those which are more effective in mitigating existing inequalities in market income. A simple regression of income stabilization on measures for openness, redistribution and the ratio of direct to indirect taxes confirms a significant positive relationship between the automatic stabilizers and each of the variables.

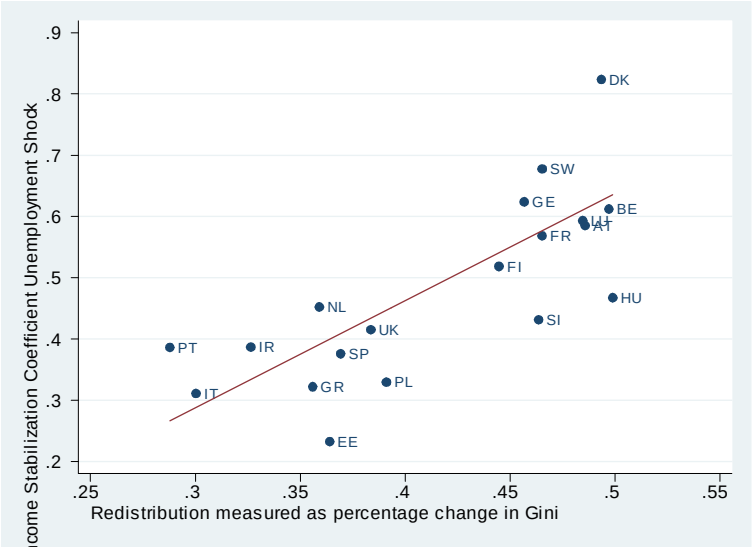
These results have to be interpreted in the light of various limitations of our

analysis. Firstly, by modeling the unemployment shock through reweighting of the sample, we implicitly assume that the socio-demographic characteristics of the unemployed remain constant. Secondly, our analysis abstracts from automatic stabilization through other taxes, in particular corporate income taxes.[8] Thirdly, we have abstracted from the role of labor supply or other behavioral adjustments for the impact of automatic stabilizers. Furthermore, 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 based on simulations 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. We intend to pursue these issues in future research.

[8] For an analysis of automatic stabilizers in the corporate tax system see Devereux and Fuest (2009) and Buettner and Fuest (2010).

3.5 Appendix

Figure 3.5.1: Income Stabilization US and Redistribution



Source: Own calculations based on EUROMOD

Table 3.5.1: Stabilization of income groups by components - Income Shock

	Q1			Q2			Q3			Q4			Q5		
	Tax	SIC	BEN	Tax	SIC	BEN	Tax	SIC	BEN	Tax	SIC	BEN	Tax	SIC	BEN
AT	0.010	0.009	0.004	0.025	0.019	0.001	0.044	0.028	0.001	0.069	0.037	0.001	0.146	0.045	0.000
BE	0.011	0.005	0.006	0.031	0.015	0.005	0.058	0.023	0.002	0.094	0.034	0.000	0.189	0.055	0.000
DK	0.012	0.003	0.001	0.033	0.007	0.006	0.068	0.015	0.005	0.108	0.022	0.005	0.234	0.039	0.000
EE	0.005	0.001	0.004	0.017	0.002	0.000	0.032	0.004	-0.000	0.058	0.005	0.000	0.117	0.010	-0.000
FI	0.006	0.001	0.003	0.024	0.004	0.002	0.054	0.009	0.001	0.086	0.013	0.000	0.170	0.022	0.000
FR	0.003	0.011	0.019	0.008	0.020	0.008	0.018	0.030	0.005	0.032	0.043	0.004	0.092	0.078	0.001
GE	0.004	0.008	0.007	0.024	0.018	0.003	0.045	0.027	0.000	0.081	0.035	0.000	0.197	0.030	0.001
GR	0.001	0.003	0.000	0.005	0.010	0.000	0.017	0.016	0.000	0.038	0.024	0.000	0.142	0.034	0.000
HU	0.008	0.013	0.008	0.021	0.018	0.001	0.034	0.021	0.000	0.065	0.031	0.000	0.177	0.076	-0.000
IR	0.004	0.001	0.004	0.016	0.004	0.006	0.039	0.007	0.002	0.072	0.011	0.001	0.179	0.017	0.001
IT	0.006	0.003	0.001	0.022	0.008	0.005	0.035	0.013	0.003	0.057	0.019	0.001	0.134	0.037	0.002
LU	0.002	0.007	0.011	0.008	0.013	0.001	0.024	0.017	0.002	0.059	0.024	-0.001	0.172	0.036	0.000
NL	0.004	0.011	0.005	0.015	0.021	0.004	0.033	0.028	0.001	0.060	0.032	0.000	0.158	0.024	0.000
PL	0.007	0.007	0.003	0.014	0.014	0.004	0.021	0.020	0.006	0.030	0.028	0.002	0.096	0.048	0.000
PT	0.001	0.003	0.009	0.005	0.007	0.001	0.015	0.014	0.000	0.036	0.019	0.000	0.145	0.048	0.000
SI	0.002	-0.000	0.019	0.007	0.007	0.003	0.008	0.000	0.000	0.034	0.010	0.003	0.238	0.014	0.002
SP	0.003	0.001	0.001	0.016	0.004	0.000	0.030	0.006	0.000	0.052	0.010	-0.000	0.139	0.014	-0.000
SW	0.013	0.002	0.007	0.031	0.006	0.004	0.055	0.010	0.001	0.083	0.012	0.000	0.186	0.009	0.000
UK	0.003	0.001	0.006	0.014	0.005	0.015	0.031	0.011	0.005	0.060	0.017	0.002	0.160	0.020	0.003

Source: Own calculations based on EUROMOD

Table 3.5.2: Stabilization of income groups by components - Unemployment Shock

	Q1			Q2			Q3			Q4			Q5		
	Tax	SIC	BEN	Tax	SIC	BEN	Tax	SIC	BEN	Tax	SIC	BEN	Tax	SIC	BEN
AT	0.002	0.005	0.104	0.008	0.017	0.068	0.016	0.027	0.026	0.033	0.043	0.053	0.103	0.078	0.000
BE	0.000	0.004	0.139	0.009	0.010	0.068	0.023	0.017	0.027	0.057	0.030	0.013	0.151	0.062	0.001
DK	-0.021	-0.003	0.120	-0.039	-0.002	0.230	0.019	0.015	0.132	0.059	0.028	0.109	0.098	0.055	0.024
EE	0.001	0.001	0.059	0.011	0.002	0.006	0.023	0.004	-0.007	0.045	0.006	-0.009	0.093	0.011	-0.013
FI	-0.017	-0.001	0.137	0.005	0.003	0.050	0.031	0.009	0.035	0.058	0.014	0.021	0.146	0.025	0.006
FR	-0.001	0.005	0.098	0.001	0.017	0.083	0.005	0.032	0.051	0.015	0.048	0.029	0.055	0.089	0.041
GE	0.001	0.005	0.137	0.010	0.018	0.051	0.023	0.029	0.037	0.047	0.042	0.029	0.128	0.050	0.015
GR	0.000	0.004	0.012	0.001	0.013	0.017	0.003	0.022	0.014	0.011	0.043	0.018	0.078	0.068	0.018
HU	0.006	0.016	0.069	0.010	0.019	0.016	0.014	0.024	0.011	0.034	0.038	-0.001	0.139	0.094	-0.022
IR	0.001	0.001	0.099	0.008	0.003	0.038	0.020	0.006	0.019	0.038	0.010	0.013	0.111	0.016	0.005
IT	0.003	0.002	0.006	0.010	0.010	0.001	0.019	0.018	0.010	0.037	0.026	0.018	0.094	0.049	0.007
LU	-0.000	-0.009	0.157	-0.000	-0.008	0.185	0.006	0.015	0.035	0.022	0.024	0.024	0.099	0.057	-0.014
NL	0.001	-0.011	0.133	0.004	0.025	0.019	0.011	0.038	0.005	0.021	0.049	0.017	0.067	0.070	0.003
PL	0.004	0.007	0.020	0.010	0.019	0.006	0.016	0.028	0.004	0.025	0.039	0.002	0.080	0.072	-0.002
PT	0.000	0.001	0.013	-0.008	0.005	0.008	0.005	0.010	0.026	0.016	0.019	0.041	0.133	0.063	0.055
SI	0.001	0.007	0.041	0.005	0.020	0.016	0.013	0.032	0.012	0.029	0.053	0.003	0.105	0.109	0.001
SP	0.001	0.005	0.032	0.004	0.008	0.037	0.010	0.011	0.044	0.021	0.016	0.039	0.088	0.028	0.033
SW	-0.040	-0.012	0.211	-0.003	-0.002	0.113	0.026	0.005	0.078	0.058	0.013	0.039	0.158	0.022	0.010
UK	-0.009	0.001	0.150	0.009	0.004	0.021	0.024	0.010	-0.004	0.044	0.017	-0.001	0.123	0.030	-0.003

Source: Own calculations based on EUROMOD

Chapter 4

Tax policy and income inequality in the US, 1978-2009: A decomposition approach

4.1 Introduction

Over the past decades, household incomes have become more unequally distributed in most OECD countries. The United States is among the countries recording the largest levels and increases in inequality (cf. OECD (2008)). The usual approach for evaluating the role of taxation as a driver of overall inequality trends is to compare income inequality measures before and after taxes (see e.g. Gottschalk and Smeeding (1997) or Heathcote et al. (2010)). However, tax burdens and their impact on the income distribution are determined by both tax schedule and tax base. For instance, a given progressive income tax schedule redistributes more when the distribution of taxable incomes becomes more dispersed, and very little if everybody earns about the same (Musgrave and Thin (1948) and Dardanoni and Lambert (2002)). At the same time, the U.S. tax system has seen a large number of changes due to policy reforms (such as lower marginal tax rates and a reduced number of tax brackets in the 1980s or a more generous Earned Income Tax Credit, EITC, in the 1990s). Given the importance of the distribution of market income for redistribution, it is however unclear how much of an observed change in tax

burdens is due to policy reforms and what part is due to other factors, notably the underlying distribution of market income (as well as other tax–relevant population characteristics, such as family structures).[1]

We assess the effect of tax reforms on economic inequality in the U.S. over the 1978–2009 period.[2] We pay special attention to separating the direct effects of policy reforms from other factors, including indirect policy effects due to behavioral responses (Poterba (2007)). To isolate the pure policy effects, we perform a series of detailed counterfactual simulations that show what the income distribution would have been if either tax policy or, alternatively, the distribution of the tax base had remained unchanged between two given years. In combination with a decomposition analysis based on Shorrocks (1999)'s reinterpretation of the Shapley value, these simulation results enable us to split changes in inequality into a direct tax policy effect and other factors which impact on income distribution.[3] By repeating the analysis for each year, this method allows us to reassess whether major U.S. tax reforms during the past three decades have either slowed or exacerbated the trend towards greater income inequality.

This paper adds to the literature analyzing pre– and post–tax income inequality in the U.S. since the late 1970s by using micro data from the Current Population Survey (CPS).[4] Our analysis is a natural follow–up of the study by Piketty and Saez (2007). While they use the NBER's TAXSIM calculator to compute changing tax burdens over time and assess their impact on changes in progressivity of the federal income tax system, we investigate their impact on changes in inequality. The novelty of our paper is that we explicitly distinguish between the measured redistributive effect of tax reforms (as a combination of tax policy and tax base

[1] Note that even without changes to the tax schedule, the tax system becomes more progressive if taxable incomes grows faster than the indexation of tax brackets – this is known as 'bracket creep' (see e.g. Saez (2003) and Immervoll (2005)).

[2] This chapter is based on Bargain, Dolls, Immervoll, Neumann, Peichl, Pestel and Siegloch (2011).

[3] Our approach formalizes analyses of policy effects, as performed for instance by Clark and Leicester (2004) for the United Kingdom. See also Bargain and Callan (2010) for France and Ireland. A related concept for the comparison of tax regimes with respect to progressivity – the *transplant-and-compare* procedure (Dardanoni and Lambert (2002)) – is applied by Lambert and Thoresen (2009) for Norway. They isolate the tax policy effect by comparing pre-tax income distributions which have been adjusted to a common base.

[4] See e.g. Heathcote et al. (2010), Meyer and Sullivan (2010), Meyer and Sullivan (2011) for studies also based on CPS data and Piketty and Saez (2007) who use tax return data.

distribution changes) on the one hand and the pure policy effect on the other hand. The former emerges from simple comparisons of pre– and post–tax income, whereas the latter results from our decomposition analysis based on counterfactual policy simulations using the TAXSIM model. We quantify the distributional impact of specific tax policy changes and compare its magnitude to other drivers of inequality changes.

Our main findings are as follows. The increase in post–tax income inequality was slower than that of pre–tax inequality indicating that the redistributive role of the tax system has increased over time. However, our decomposition reveals that most of this increase in redistribution was not due to the policy effect but a mechanical consequence of the rising inequality in pre–tax income. Indeed, the effects of policy changes more or less canceled out over the period as a whole – which is a direct consequence of partisan politics. Our findings are in line with popular perceptions regarding the political cycle, with disequalizing (equalizing) effects observed for policy changes implemented during Republican (Democrat) administrations (see Bartels (2008)). The results for some sub–periods show large effects for actual policy changes – sometimes accounting for more than 50 percent of the increase in post–tax inequality (Tax Reform Act of 1986). There are also significant differences between results for the lower and upper parts of the distribution. Policy reforms enacted in the early and mid 1990s reduced income gaps at the bottom to below their 1978 values. The equalizing effect of tax policy on inequality at the lower half of the distribution is maintained until the end of the observation period and even enforced by provisions enacted through the American Recovery and Reinvestment Act. By contrast, no equalizing effects of policies can be discerned for the upper part of the distribution. Instead, for the period as a whole, tax policy changes affecting top–income earners appear to have slightly exacerbated trends towards widening income gaps at the top.

The rest of the paper is organized as follows. Section 4.2 reviews the existing U.S. income inequality literature and particularly focuses on the impact of tax policy on the income distribution. The decomposition analysis, the data and income concepts are described in section 4.3. Results are presented in section 5.5. Section 4.5 concludes.

4.2 Literature

Rising income inequality in the U.S. has stimulated a large body of research examining the underlying driving factors. In this literature, several strands have emerged which focus on different types of inequality. While the focus of this paper is on redistribution and the impact of tax policy on trends in post–tax income inequality, the latter cannot be comprehensively assessed without taking into account trends in pre–tax inequality.

The development of wage and earnings inequality has triggered a vast amount of research. A key result of the literature is that wage inequality increased substantially during the late 1970s and early 1980s. For instance, Gottschalk and Danziger (2005) find that the development of male wage and family income inequality were largely comparable over the period 1975 to 2002.[5] Autor, Katz and Kearney (2008) provide an overview of the literature on U.S. wage inequality and discuss if the substantial increase since the 1980s can be considered as an episodic event or a continuous development.[6]

Two explanations for a rising wage dispersion are globalization and skill–biased technological change. Both may have a negative effect on wages of low–skilled workers, but a positive one on those of the high–skilled. While there is a direct channel from individual wage to family income inequality, other trends than those affecting individual wage inequality clearly coexist and impact trends in family income. Among those, the labor force participation of women, assortative mating and other aspects of family formation have been discussed in the literature.[7]

Moving from the individual to the household level, income inequality widened

[5] They further report that male wage and earnings inequality had similar trends, though earnings inequality showed a cyclical pattern due to changes in hours worked at the bottom of the distribution. Contrary, caused by the increase in hours worked of females at the bottom of the distribution, female earnings inequality decreased over the last three decades and thus reversed the trend of growing wage inequality.

[6] See e.g. Card and DiNardo (2002) for the former argument, whereas Autor et al. (2008) find support for the latter. They show that while male wage inequality in the lower half of the distribution grew strongly in the first half of the 1980s and declined afterwards, inequality in the upper half of the distribution kept growing in the 1990s and 2000s.

[7] It is beyond the scope of this paper to provide a general discussion of the sources contributing to an increase in inequality or to quantify the contributions of certain factors affecting inequality (see e.g. Gottschalk and Smeeding (1997) for the first and Burtless (1999), Daly and Valletta (2006) or Larrimore (2010) for the latter point).

in the 1970s (cf. Lindert (2000)) and continued to rise sharply in the 1980s. Studies using the CPS find that total income inequality, i.e. inequality in pre–tax, post–transfer income rose sharply in the 1980s, and that this growth continued at a reduced pace in the 1990s and early 2000s.[8] Evidence for the trend in pre–tax income inequality since the 1990s that seems to be contrasting at first glance, however, is reported by Piketty and Saez (2003) (updated 2008) who build series of top income shares based on tax return data from the Internal Revenue Service (IRS). They find that the share of income held by the richest groups grew in the 1990's, and with the exception of the period 2000–2002, continued to rise in the following years.[9] Burkhauser, Feng, Jenkins and Larrimore (2012) seek to reconcile some of the findings from these two data sources. They use internal CPS data which are – compared with public–use CPS – much less affected by topcoding (although a number of other measurement and conceptual differences remain) and apply similar income definitions as Piketty and Saez (2003) do, namely pre–transfer, tax–unit income. They conclude that the rise in inequality from 1993 onwards is mainly due to gains made by the top 1 percent of the income distribution.

Recent studies which analyze trends in post–tax income inequality and redistribution in the U.S. are Meyer and Sullivan (2010) and Heathcote et al. (2010). The former find that post–tax income inequality started to increase later (in the late 1970s) than that of pre–tax income and that its increase in the 1980s occurred at a slower rate. Somewhat contrasting, one finding of the latter is that trends in pre– and post–tax income inequality had been similar in the 1980s, but the gap widened (and redistribution therefore increased) in the 1990s.[10] A large part of redistribution in the U.S. takes place through tax expenditures. Since 1986,

[8] See e.g. Gottschalk and Danziger (2005), Burkhauser, Feng and Jenkins (2009), Meyer and Sullivan (2010), Heathcote et al. (2010), Burkhauser, Feng, Jenkins and Larrimore (2011). Differences between these studies exist with regard to the definition of the income unit (family vs. household), sample selection (full population vs. working-age population) and whether or not topcoding in the public-use CPS is accounted for.

[9] Further studies relying on IRS tax return data are Slemrod (1992), Feenberg and Poterba (1993), DeBacker, Heim, Panousi and Vidangos (2010) and Bakija, Cole and Heim (2012) who, in particular, look at top incomes, though this list is not exhaustive.

[10] Note that a key difference between these two studies is the selection of the sample. While Meyer and Sullivan (2010) use the full CPS sample, the household-level sample in Heathcote et al. (2010) is restricted to those households with at least one member in working-age.

the Earned Income Tax Credit (EITC) has been extended in several steps and nowadays represents an important element of the federal tax system in terms of redistribution to the working–poor.[11] However, the redistributive capacity of the income tax system does depend – besides tax expenditures – on many factors such as the degree of progressivity, the relative importance of certain components and the distribution of pre–tax income.[12]

Our paper contributes to the strand of the literature which examines the impact of tax policy on post–tax income inequality. By extracting the direct policy effect through counterfactual simulations, we complement analyses conducted by Piketty and Saez (2007) or the Congressional Budget Office (2010). In these studies, shares of post–tax income and average federal tax rates are calculated for all income groups and similar time periods, but the estimates do not allow to isolate the direct policy effect since they reflect both legislative changes as well as other factors which influence tax rates. Some studies have conducted so–called "what if" calculations (cf. Poterba (2007), p. 630) but to the best of our knowledge, none of these papers have sought to identify a policy effect on a year–by–year basis over a long time period. We are aware of two contributions which explicitly consider – via counterfactual simulations – the impact of tax policy on the post–tax income distribution. In an analysis of policy changes during the 1980s, Gramlich, Kasten and Sammartino (1993) apply tax and transfer policies of 1980 and 1985 to the pre–tax income distribution of 1990. They report that 16 percent of the increase in the Gini coefficient from 1980 to 1990 are due to changes in taxes and transfers, although the exact scope of their study in terms of simulated taxes and transfers is not clear. More recently, Poterba (2007) conducts conceptually similar policy swaps by applying 2004 effective tax rates to the 2000 pre–tax income distribution and vice versa and examines the resulting effects on the share of post–tax (but before payroll tax) income accruing to various income groups. A key finding from

[11] See e.g. Hotz and Scholz (2003), Meyer (2010) and Eissa and Hoynes (2011) who document the growing redistributive impact of this program.

[12] For studies examining the progressivity of the tax system, see e.g. Kasten, Sammartino and Toder (1994), Bishop, Chow, Formby and Ho (1997), Alm, Lee and Wallace (2005) and Piketty and Saez (2007). The latter find that the progressivity of the overall federal tax system declined substantially at the top of the income distribution since the 1960s. Mitrusi and Poterba (2000) describe the growing importance of payroll taxes relative to the income tax since the early 1980s.

this analysis is that the impact of changes in the pre–tax income distribution is approximately four times as large as the policy effect of changes in effective tax rates.[13]

4.3 Methodology

4.3.1 Decomposition

We follow the decomposition approach by Bargain and Callan (2010). Consider a data matrix y containing information on individuals' pre–tax income from different sources as well as various individual and household characteristics which are relevant for the calculation of income and payroll taxes. The tax function d represents the rules and structure of the tax system (e.g., marginal tax and contribution rates) while vector p accounts for all the monetary parameters (e.g., tax band limits). In this way, the distribution of post–tax income is represented by $d_i(p^j, y^l)$ for tax rules of year i, tax parameters of year j and nominal incomes of year l. We shall also consider the possibility of nominally adjusting income levels and/or parameters p by an uprating factor α. For instance, the counterfactual situation $d_{t+1}(p^{t+1}, \alpha^{t+1}y^t)$ represents post–tax incomes obtained by applying tax rules and parameters of year $t+1$ on year t data nominally adjusted to year $t+1$. This backdrop, where the new policy is evaluated while holding the population constant, is used in the decomposition below. Symmetrically, we may evaluate the distribution obtained with the initial policy applied to the new population. For this, we need to construct a counterfactual $d_t(\alpha^{t+1}p^t, y^{t+1})$ where tax parameters are uprated using the same factor α^{t+1} as used to scale up the distribution of

[13] Further studies examining the degree of redistribution of the U.S. income tax system by means of policy swaps are Kasten et al. (1994), Mitrusi and Poterba (2000), Alm et al. (2005), Leigh (2008b) and Meyer (2010). However, these studies do not quantify how much of an observed change in post–tax income inequality is due to policy changes. Instead, the focus of these contributions is on the changing importance of income and payroll taxes over time (Mitrusi and Poterba (2000)), on the progressivity of the income tax (Kasten et al. (1994) and Alm et al. (2005)), the redistributiveness of state taxes (Leigh (2008b)) and the distributional effect of the EITC reform enacted through the American Recovery and Reinvestment Act of 2009 (Meyer (2010)).

gross income between period t and $t+1$.[14] As further explained below, policy changes under study possibly combine changes in policy structure d and changes in parameters p (the 'uprating policy').

In the empirical part, we are interested in relative inequality indices I, computed as a function $I\left[d_i(p^j, y^l)\right]$ of the simulated distribution of post–tax income. The advantage of the present approach is that we may use any inequality measure and not only those with specific properties (i.e., decomposable indices). In general, it is possible to decompose any scalar I, e.g. average and effective marginal tax rates, measures of tax redistribution or automatic stabilization. Characterize total change ΔI in the inequality index I between initial and final period as

$$\Delta = I\left[d_{t+1}(p^{t+1}, y^{t+1})\right] - I\left[d_t(p^t, y^t)\right] \tag{4.3.1}$$

and notice that the last term can also be written $I[d_t(\alpha^{t+1}p^t, \alpha^{t+1}y^t)]$ since function d is linearly homogenous in p and y.[15] Then, the total change between periods t and $t+1$ can be decomposed into the contributions of changing policy and of changing data (i.e., changing the underlying gross income distribution due to all effects not directly due to tax reforms). The policy effect can be assessed on end period data y^{t+1}, and in this case, the data or "other" effect is assessed on the base period tax system, yielding the decomposition I:

$$\begin{aligned}\Delta I \;=\; & \underbrace{I[d_{t+1}(p^{t+1}, y^{t+1})] - I[d_t(\alpha^{t+1}p^t, y^{t+1})]}_{\text{policy effect I}} \\ & + \underbrace{I[d_t(\alpha^{t+1}p^t, y^{t+1})] - I[d_t(\alpha^{t+1}p^t, \alpha^{t+1}y^t)]}_{\text{other effect I}}\end{aligned}$$

Notice that in this case, base period tax parameters are applied to end period data y^{t+1} after nominal adjustment, i.e., writing parameters as $\alpha^{t+1}p^t$. Symmetrically,

[14] A measure $d_t(p^t, y^{t+1})$ would not be consistent since base-period parameters would be artificially applied to end-period income levels. For instance, previous tax band thresholds would be applied to new and possibly higher income levels, thereby generating artificial 'fiscal drag' (see Saez (2003) or Immervoll (2005)).

[15] Converting tax parameters and income from dollars into euros does not change the relative location of households in the distribution of post–tax income.

the decomposition can be written as a policy effect assessed on base year data followed by a change in underlying data conditional on the new policy. This decomposition II is thus written as:

$$\begin{aligned}\Delta I &= \underbrace{I[d_{t+1}(p^{t+1}, y^{t+1})] - I[d_{t+1}(p^{t+1}, \alpha^{t+1}y^t)]}_{\text{other effect II}} \\ &\quad + \underbrace{I[d_{t+1}(p^{t+1}, \alpha^{t+1}y^t)] - I[d_t(\alpha^{t+1}p^t, \alpha^{t+1}y^t)]}_{\text{policy effect II}}.\end{aligned}$$

In this case, the end–period tax system is evaluated on nominally–adjusted base–period data $\alpha^{t+1}y^t$.

As the decompositions are *path dependent*, we simply average policy and other effects respectively over the decompositions I and II. Doing so corresponds to the suggestion of Shorrocks (1999) of using a Shapley value procedure whereby the contribution of a given factor (to a change in the statistic I) is obtained by extracting the marginal contribution of eliminating this factor and averaging these marginal contributions over all possible elimination sequences. In the empirical sections, however, we shall verify that results based on decompositions I and II are not too different to each other and to the average Shapley decomposition result.

In the decompositions, it is important to understand that the nominally–adjusted tax schedule, $\alpha^{t+1}p^t$, is not identical to the *actual* set of parameters p^{t+1} as decided by the policy–maker. Hence, the policy effect does not only capture the effect of changes in policy structure (d_t to d_{t+1}) on the income distribution but also the *actual* uprating policy (shift from p^t to p^{t+1}) against a scenario where parameters are adjusted in line with the uprating factor α^{t+1}. The way tax brackets are uprated by governments can have important implications for the income distribution and public spending in the long run. Standard practice consists in one of the three following options: (1) no uprating, (2) uprating according to the level of price inflation, (3) uprating according to the level of earnings growth. With non–indexation of tax brackets in progressive systems, or price indexation when incomes rise faster than prices, the total number of tax payers (and the number of higher–rate taxpayers) increases. This phenomenon of 'fiscal drag' or 'bracket creep' must affect the final distribution of post–tax income (see Saez (2003) and

Immervoll (2005)). In our empirical application, we use changes in the consumer price index. This reference situation is extensively used in policy analyses of tax reforms (cf., discussion in Clark and Leicester (2004)). This choice is also justified on historical ground as it aims to guarantee some continuity in the evaluation of policies (see Sutherland, Hancock, Hills and Zantomio (2008)). In a robustness check (see section 4.4.3), we rely on a more conservative approach based on nominal wage growth, i.e., a distributionally–neutral backdrop (cf. Bargain and Callan (2010)). A related issue is the question whether it is interesting to further decompose our policy effect into the contributions of structural changes and uprating policy, respectively. For some types of reforms, these two components are usually intertwined in a way that makes the distinction irrelevant and arbitrary. For instance, a change in the maximum amount of EITC, other monetary parameters being held constant, also entails a necessary change in the phase–in and phase–out rates. Classifying the former as uprating policy change and the latter as "structural" policy change is probably meaningless. However, in the empirical results, we should pay attention to periods where uprating policies were subject to specific changes, typically price–indexation policies during high inflation periods.

With the present approach, we are able to account for direct effects of tax policy changes but don't consider the indirect response to changes in tax policy (Poterba (2007), p. 632–633, Slemrod (1992), p. 108).[16] For instance, reforms may affect labor supply behavior and hence the distribution of gross income. In particular, the EITC reforms have been shown to change substantially participation rates among married couples and single mothers (cf., Eissa and Hoynes (2006), among others). In addition to adjustments in participation or work hours, tax reforms may affect many different other margins (e.g., tax evasion) and change the tax base at all levels and in particular at the top of the distribution. This point is investigated in the new tax responsiveness literature (Feldstein (1995), Gruber and Saez (2002) and Saez, Slemrod and Giertz (2012)). Hence, further research may account for this indirect effect, which could be handled in the present decomposition framework. However, as we look at year–to–year changes, the "other effect" should more or

[16] Piketty and Saez (2007), p.9, however, argue that given the controversy about behavioral responses to taxation "[...] considering the basic case with no behavioral response is a useful starting place".

less equal the indirect, behavioral effect as other, structural changes are unlikely to occur in the short–run.

4.3.2 Data

Several data sources have been used in studies focusing on the impact of taxation on income inequality, in particular tax return data (e.g. Piketty and Saez (2007)) and household surveys such as the CPS (e.g. Alm et al. (2005)). It is well–known that there are pros and cons for both types of data sources (Poterba (2007)). In brief, tax return data allow to precisely calculate top income shares, but do not contain information about non–filing households (typically at the bottom of the distribution) and lack certain (tax–relevant) components of household income. The CPS is a rich micro–data set of U.S. households and a primary data source for investigating income and distribution trends. It is also the source for official U.S. government statistics on (un)employment and poverty. However, it does not contain information with respect to itemized deductions which might affect our results. Further, for confidentiality reasons, the U.S. Census Bureau "top codes" (i.e. censors) all income sources, with differences in methods between some years. This can cause a downward bias of income inequality estimates.

In this study, we use data from IPUMS–CPS (Integrated Public Use Microdata Series, Current Population Survey) which is a harmonized set of data of the Annual Social and Economic 'March' Supplement (ASEC) comprising the years 1962–2010. The CPS is a monthly U.S. household survey representative of the civilian non–institutional population and jointly conducted by the U.S. Census Bureau and the Bureau of Labor Statistics. Importantly, we are able to overcome the shortcomings associated with this data source. First, to alleviate the problem of topcoding, we use an extended series of cell means constructed from internal CPS (see Larrimore, Burkhauser, Feng and Zayatz (2008) and Burkhauser, Feng and Larrimore (2010)) which enables us to closely replicate inequality trends found in the internal CPS data.[17] Further, we focus our analysis on percentile ratios such as the 90/10 ratio which is standard in the U.S. income inequality literature (see e.g. Gottschalk

[17] Note that even internal CPS data is censored. However, Burkhauser et al. (2012) show that with internal CPS data, it is possible to match top income shares reported by Piketty and Saez (2003) who use Internal Revenue Service (IRS) tax return data.

and Danziger (2005), Meyer and Sullivan (2010)). Second, for the imputation of itemized deductions we use data from the Internal Revenue Service (IRS). These are representative micro–level tax return files compiled annually by the Statistics of Income (SOI) division of the IRS. In a sensitivity check, we explore how our results are affected by this imputation (see section 4.4.3).

4.3.3 Sample selection, income concepts and the calculation of counterfactual scenarios

Our sample solely includes non–elderly households meaning that at least one member of the household is in working–age, i.e. between the ages of 15 and 64. The motivation for this sample selection is driven by the fact that our analysis entirely focuses on tax–policy and does not consider the policy effect of transfers targeted to the elderly. In a robustness check, we recalculate our results for the full population. We use the square root of household size as equivalence factor in order to account for economies of scale within households (see e.g. Atkinson, Rainwater and Smeeding (1995) or Burkhauser et al. (2009)).

Throughout this paper, we focus on pre– and post–tax income inequality which are defined as commonly done in the literature (e.g., Heathcote et al. (2010) and Meyer and Sullivan (2010)). Pre–tax income is taken from the data and follows the Census definition of money income that is used to measure poverty and inequality. It is computed as the sum of market income (sum of pre-tax wage and salary income, business and farm income, interest, investment, and rental income) plus private (e.g. alimony) and public transfers (e.g. unemployment benefits, Social Security, SSI, welfare payments). Post–tax income is defined as pre–tax income minus the simulated components of the income tax system including federal income taxes, state income taxes, employee social insurance contributions (payroll taxes), and tax credits (e.g. EITC).

For the calculation of the baseline as well as for counterfactual scenarios and the isolation of the tax policy effect – i.e. applying policy parameters from the base period to the population of the end period or policy parameters from the end period to the population of the base period – we use NBER's simulation model

TAXSIM.[18] The simulation approach allows conducting a controlled experiment by changing the parameters of interest while holding everything else constant which avoids endogeneity problems when identifying the effects of the policy reform under consideration (cf. Bourguignon and Spadaro (2006)). When assessing the isolated role of tax policy on income inequality, we are thus able to account for changes in federal and state level income taxes as well as payroll taxes and tax credits such as the EITC. Our analysis spans the period 1978 until 2009.

4.3.4 Tax history

In this section, we briefly outline the major changes in the U.S. federal income tax system from 1978 until 2009 which are also summarized in Table 1. We concentrate on large legislative changes which drive the tax policy effect described later in this section. Reforms of interest are the Revenue Act of 1978 (RA78), the Economic Recovery Tax Act of 1981 (ERTA81), the Tax Reform Act of 1986 (TRA86), the Omnibus Budget Reconciliation Act of 1990 and 1993 (OBRA90 and OBRA93), the Taxpayer Relief Act of 1997 (TRA97), the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA01), the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA03) and the American Recovery and Reinvestment Act of 2009 (ARRA09).

The aim of RA78 was to enhance real GDP growth (Romer and Romer (2010)). For that purpose, by widening tax brackets and reducing the number of tax rates, individual taxes were reduced. Further, at that time inflation was relatively high and individual income tax parameters were not fixed for inflation so that "bracket creep" led to increases in income tax revenue as a percentage of GDP. RA78 to some extent attenuated this effect and caused a yearly reduction in tax revenue of on average 0.83 percent of GDP in the four years after the reform (c.f. Tempalski (2006) for estimates of revenue effects mentioned in this section).

ERTA81 introduced the indexation of individual income tax parameters which became effective in 1985. Tax cuts were phased in over the years 1982–1984, with a reduction of top marginal tax rates from 70 to 50 percent in 1982 and of other tax

[18] For more information on TAXSIM see Feenberg and Coutts (1993) or visit http://www.nber.org/taxsim/.

rates by 23 percent in three annual steps. Further, the income threshold for the top rate substantially increased from \$85,600 in 1982 to \$109,400 (1983) and \$162,400 (1984) for married couples filing jointly. Similar threshold increases occurred for couples filing separately and singles. The reduction in tax revenue amounting to 2.89 percent of GDP (four year average) was substantially larger than for RA78.

The motivation of TRA86 was to make the tax system simpler and more conducive to long–run growth (Auerbach and Slemrod (1997) and Romer and Romer (2010)). Key aspects of the reform were the broadening of the tax base and reductions in marginal tax rates. Consequently, the reform was almost revenue neutral. TRA86 further lowered the top marginal rate to 38.5 percent in 1987 and to 28 percent in 1988, reduced the number of tax brackets from 15 in 1986 to four in 1988, but also substantially expanded the EITC with financial benefits for low–income households.

Reforms in the 1990s which had considerable direct policy effects are OBRA90, OBRA93 and TRA97. OBRA90 contained increases in income taxes as well as expansions of the EITC and other low–income credits. Further, payroll taxes were increased by lifting the taxable maximum for Hospital Insurance which were finally abolished in 1994. OBRA93 then led to the largest single expansion of the EITC (cf. Eissa and Hoynes (2011)), and further increases in income tax rates were implemented, e.g. the top rate rose from 31 to 39.6 percent in 1993. The EITC became much more generous in 1994 with higher maximum credits and an expansion to single workers with no children. These EITC expansions continued in the next years. The revenue effect of OBRA90 and OBRA93 was – again evaluated on a four year average – positive and amounted to 0.5 and 0.63 percent of GDP, respectively. TRA97 lowered capital gains tax rates and introduced additional tax credits (child and education tax credits).

EGTRRA01 and JGTRRA03 were characterized by reductions in marginal tax rates, both for low– and high–income families, expansions of the child tax credits, and reductions in taxes on dividends. In 2003, JGTRRA accelerated those provisions of EGTRRA which were not set to become effective until 2006. Both reforms had a revenue–decreasing effect (–0.71 and –0.57 percent of GDP, 4 year average).

Finally, ARRA09 was a countercyclical fiscal stimulus program in response to

the severe economic contraction in 2008/2009. It contained, among other measures, individual tax cuts and adjustments of the Alternative Minimum Tax (AMT) which, together with some business tax incentives, accounted for $263.3 billion of the total $787 billion program at the end of December 2009 (see e.g. Council of Economic Advisors (2010a)). Important tax measures were the creation of the Making Work Pay Credit, a refundable tax credit of up to $400 for working individuals and up to $800 for married taxpayers filing jointly, the American Opportunity Tax Credit, EITC expansions and an extension of the AMT relief to 2009 as well as an increase in the AMT tax exemption (Council of Economic Advisors (2010b), Tax Policy Center (2011)).

4.4 Results

4.4.1 Trends in average tax rates and income inequality

Before we turn to the decomposition analysis, we first describe the general trend in average tax rates and income inequality during the observation period. For the calculation of average tax rates, we group households by quintiles of market income and calculate the share of income paid in federal and state level income taxes.[19] We account for tax expenditure on the federal and state level. Results are reported in Figure 4.6.1. Compared with the average tax rates for households at the top and the bottom of the income distribution, those for the second to fourth income quintile show less variation and are combined in one series. The average tax rate for the highest quintile decreased from a peak in 1981 (almost 30 percent) until reaching the trough in 1990 (23 percent). It constantly increased in the 1990s reaching again the 30 percent level in 2000 before it started to fall in the following years. Contrary, the average tax rate for households in the lowest income quintile was almost constant until 1990 and turned negative afterwards. It decreased dramatically in the period from 1990 to 1996 due to expansions of the EITC. After a slight increase in the second half of the 1990s, it fell again

[19] Cf. Piketty and Saez (2007) who also rank families by market income, but focus on federal taxes. Contrary, estimates for average tax rates of the Congressional Budget Office (2010) are based on comprehensive household income including cash transfers and in-kind benefits.

after 2000. Marked changes in average tax rates occured especially during the Great Recession period of 2008/2009. While the average tax rate for the lowest quintile increased sharply in 2008, the drop in 2009 was even larger. The increase in 2008 was due to the substantial decline in market income of households at the bottom of the distribution (see also Figure 4.6.2) which was caused by an unprecedented rise in the unemployment rate. In fact, this trend continued in 2009 with the unemployment rate reaching a peak of 10.1 percent in October 2009 (U.S. Department of Labor. Bureau of Labor Statistics (2010)), but at the same time, discretionary policy measures enacted through ARRA09 (cf. section 4.3.4 and Table 1) became effective and led to a sharp decline in tax liabilities, particularly for low income households (Council of Economic Advisors (2010b)).

Income inequality in the United States has increased dramatically over the past 30 years. For instance, for households headed by working–age individuals, market incomes in the upper part of the distribution show an upwards trend in almost all periods since 1978, while they increased remarkably little in the middle and show large and sustained declines at the bottom during and after recessions (cf. Figure 4.6.2). This is particularly true for the recent economic crisis.

The following analysis is essentially based on three percentile ratios which capture different parts of the income distribution (90/10, 90/50 and 50/10) and spans the period from 1978 to 2009. Importantly, we now focus on pre– and post–tax income instead of on market income (cf. section 4.3.3). We first describe the overall trend in pre–tax inequality. Figure 4.6.3 reports the percentile ratios at each point in time while Figures 4.6.4–4.6.7 show the absolute change relative to the starting year 1978 (black dots). The 90/10 ratio for household pre–tax incomes increases by roughly 3.2 points (from 6.1 to 9.3, or by 52 percent) over the period as a whole. The upper and lower half of the distribution equally contribute to this increase. In line with other studies on inequality trends, the increase was particularly steep until the early–mid 1990s (see section 4.2). The gap between the 90th and the 10th percentiles then dropped until 2000 before rising again at a reduced pace in the years before the Great Recession and accelerating during the 2008-2009 period (cf. Burkhauser and Larrimore (2011)).

Post–tax inequality series closely follow the pre–tax series, but with some differences between the three ratios as is illustrated in Figures 4.6.4–4.6.7. The dark

triangles show the difference between the series for pre– and post tax inequality (i.e. the line "measured redistribution" gives the differential between pre–tax inequality in period t relative to its base year value in 1978 and post–tax inequality in t relative to the base year). Although there are some fluctuations, the overall picture is one of a rather constant (in case of 90/10 and 50/10 ratio) or slightly decreasing (90/50) difference in pre– and post–tax inequality in the 1980s. Beginning in the early 1990s, however, the difference started to increase for all three measures until reaching a peak in the late 1990s (90/10 and 50/10 ratio) or the early 2000s (90/50 ratio). After a slight reduction, all three series remained constant until the mid 2000s. This development is in line with previous research, see e.g. Heathcote et al. (2010) who report similar trends for the Gini coefficient. During the Great Recession period, post–tax inequality increased significantly in 2008, whereas part of this increase was reversed in 2009 due to the tax cuts enacted through ARRA09.

The fact that the difference between pre– and post–tax income inequality largely remained constant during the 1980s and became larger in certain periods (in particular during 1989–1994 for the 90/10 and 50/10 ratio and until the early 2000s for the 90/50) shows that the overall redistributive capacity of the U.S. income tax system significantly rose during these periods (see e.g. Heathcote et al. (2010)). However, it can be suspected that this increased redistributive effect was driven by the very pronounced increase in pre–tax inequality over time. Clearly, actual policy effects and the indirect role of pre–tax income changes cannot be disentangled with a simple comparison of pre– and post–tax inequality. As explained in our methodology section, the decomposition analysis that follows allows us to separate both effects by controlling for the underlying pre–tax income distribution.

4.4.2 Decomposition results

We first illustrate the decomposition procedure with Tables 2–4. In each of these tables, we compare two years, i.e., before and after important legislation changes have been enacted (base and end year). We decompose the total change in post–tax inequality into two components. The first is due to tax policy reforms (tax policy effect) while the second is due to changes in the underlying data ("other" effect). Precisely, the latter effect accounts for changes in the distribution of market

income (labor or capital income), in the population (participation rates, household structure which affects equivalence scales) and in replacement incomes which are included in pre–tax income (e.g. unemployment benefits or welfare payments). For instance, Table 2 analyzes changes in inequality which occurred between the base year 1978 – the year when the RA78 reform was enacted – and year 1980 when it was fully phased–in. The left part of the table reports the different components of the decomposition as detailed in section 4.3, including base and end period scenarios ((0)/(1) and (4) respectively) as well as all the relevant counterfactuals (scenario (2) answers the question how large inequality would have been, had the tax system of 1978 been in place in 1980; (3) is the counterfactual scenario of the 1980 tax system being in place in 1978). The column labeled "(4)–(0)" shows the total change in inequality over time. The right part of the Table reports both the policy and "other" effect for decompositions I, II and the Shapley–value approach.

The other effect. To understand the decomposition results, we start with the "other" effect which is shown in the last column of Tables 2–4 for the Shapley–value decomposition. A substantial part of the increase in post–tax income inequality which can be observed in those periods during which the large tax reforms were phased–in was due to changes in the pre–tax income distribution. For example, the 90/10 ratio would have increased by 0.28 points from 1978 to 1980 if no tax policy change had occurred (cf. Table 2 for the years 1978–1980). The sign of the inequality change due to the other effect is also positive for the reform periods 1981–1984 and 1986–1988. This partly captures income shifting from the corporate to the individual sector, especially after TRA86 (see e.g. Feenberg and Poterba (1993) and Slemrod (1996)). The other effect is even more pronounced for some of the following reform periods, especially for the period from 1989 to 1994 which was characterized by a steep increase in inequality (see last section). In this period, the 90/10 ratio of post–tax income would have increased by 0.54 points – a larger effect as was actually observed (cf. Table 4 for the period 1989–1994) – in the absence of any changes in tax policy.

The direct policy effect. Following a chronological order, we start with RA78 to assess the effect of legislative changes in tax policy on post–tax income in-

equality. As can be seen from the Shapley–value policy effect, RA78 counteracted the trend of growing inequality. However, the inequality–decreasing effect of tax policy was not large enough to offset the overall trend of growing inequality. The tax policy effect led to a reduction in all inequality measures considered in our analysis. Results for decompositions I and II yield almost identical effects.[20]

A different picture emerges for the two large tax reforms in the 1980s. The effect of ERTA81 was to exacerbate the trend of growing inequality over the years 1981–1984, with 35–50 percent of the increase in post–tax inequality – depending on the chosen inequality measure – due to the reform (i.e. the tax–policy effect divided by the total change in post–tax inequality).

Contrary to ERTA81, TRA86 certainly contained both inequality–increasing (reduction in top marginal tax rates) and –decreasing elements (expansion of EITC, tax base broadening). This can be seen in the last two columns of Table 3 (1986–1988). The policy effect of TRA86 led to a slight decrease (increase) in inequality at the bottom (top) of the distribution (50/10 and 90/50 ratio). Interestingly, the inequality–increasing effect of TRA86 on the Gini coefficient as well as the 90/10 and 90/50 ratios was even larger than the increase due to changes in the pre–tax income distribution. The contribution of tax policy to the growing post–tax inequality ranges between 67–76 percent for this period.

The period in the early 1990s was then characterized by steep increases in pre– and post–tax income inequality. OBRA90 and OBRA93 counteracted – at least to some extent – the rapidly growing inequality at that time. Comparing the years 1989 and 1994, i.e. the year before OBRA90 was enacted with the year when OBRA93 was effective (cf. Table 4, 1989–1994), one can conclude that the overall effect of these reforms was inequality–decreasing, especially in the lower half of the distribution due to large expansions of the EITC. The tax policy effect worked in the opposite direction as changes in the pre–tax income distribution and made up 75 percent of the other effect for the lower part of the distribution, whereas it was negligible for the upper part of the distribution.

[20] The comparison of columns (4) and (2) of Table 2 (1978-1980) reveals that, without RA78, inequality in 1980 would have been higher as it actually was in that year. The second counterfactual reported in this table is shown in column (3). If the tax system of 1980 had been in place in 1978, inequality would have been lower compared with the observed inequality in 1978 (compare columns (3) and (1)).

Finally, we show in the lower part of Table 4 (2000–2004) that the effect of EGTRRA01 and JGTRRA03 was to increase inequality, in particular in the middle and at the top of the distribution through reductions in marginal tax rates. However, overall the policy effect was moderate compared with the increase in inequality due to changes in the pre–tax income distribution and accounted for up to 22.2 percent of the total increase in post–tax inequality. An overall assessment of the policy effect of ARRA09 is not possible yet as its measures extend to 2010 for which no data are available at the time of writing of this paper. However, its impact on average tax rates is discussed in the following section.

Policy effect on average tax rates. Average tax rates are influenced by changes in tax policy and the distribution of pre–tax income in the same way as the inequality measures discussed above. Hence, we isolate the policy effect and report the (cumulative) hypothetical change in average tax rates (in percentage points) if the pre–tax income distribution would have remained constant during the whole observation period in Figure 4.6.9. Strikingly, in the 1980s the policy effect on average tax rates was strongest for households in the highest income quintile. Taken together, ERTA81 and TRA86 (time period 1981-1988) reduced average tax rates by 10 percentage points for the fifth quintile, by 6 percentage points for the fourth quintile, by 4 percentage points for the third quintile, but only by 1 (3) points for the second (first) quintile. The EITC reforms starting with OBRA90 and OBRA93 led to considerable reductions in average tax rates for low income households while tax reforms in the early 2000s further reduced average tax rates at the top of the distribution. Tax changes implemented through ARRA09, e.g. extensions of existing tax credits (EITC) and the implementation of new credits (Making Work Pay Credit), further reduced average tax rates, in particular at the bottom of the distribution.

Year–to–year analysis. We have replicated the decomposition analysis for all years in the data and report the results in Figures 4.6.10–4.6.13. In these graphs, policy and "other" effects are presented as percent of post–tax income inequality of the previous year. The total effect, which is simply the sum of both effects, is the percentage change between two consecutive years. Confirming the results presen-

ted above for specific policy events, these graphs demonstrate that the policy effect was usually smaller than the other effect in years where policy reforms occurred (and obviously zero in years with no or minor changes in the tax schedule). In certain periods, tax policies actually aggravated the increase in pre–tax income inequality, while they were more "countercyclical" in other times. The former was particularly true for the 1980s when the tax cuts of ERTA81 and TRA86 became effective (the policy effect actually outweighed the "other" effect in 1983 for 90/10 and 90/50 and in 1987 for 90/10). This was also the case, for the 90/10 and 50/10 ratios, in some of the years after 1993 when pre–tax income inequality went down and tax–policy enforced this trend. The latter – an inequality–reducing effect – was pronounced in the late 1970s (RA78), in the period 1990–1993 (OBRA90 and OBRA93), mainly due to expansions of the EITC, as well as in 2009 (ARRA09).

Figure 4.6.14 extracts the policy effect (again relative to the inequality measure of the previous year) for all three percentile ratios. It confirms that the different parts of the distribution were affected simultaneously, with some exceptions. In particular, the 90/50 ratio showed very little response to the policy changes in the 1990s. This reflects the fact that EITC extensions concerned more the lower incomes.

Comparison to the literature. There is no comparable study which covers such a long time period in a consistent framework as we do. Previous research has been partial in the sense that it focused on one policy event or a much shorter time period. Gramlich et al. (1993) and Poterba (2007) who discuss the relative size of the policy effect relative to the changes in the pre–tax income distribution, are the studies closest to ours. First, it must be stressed that a comparison with these studies has to be handled with some caution given the differences with respect to simulated policies, inequality measures, income concepts and data used. Nevertheless, the policy analyst might gain some insight about the quantitative impact of tax policy on income inequality. Gramlich et al. (1993) find that 16 percent of the increase in the Gini–coefficient in the 1980s was due to changes in policies, yet it seems these authors account for a broader policy effect that includes transfers.[21]

[21] Gramlich et al. (1993) argue that with policy parameters of 1980 still in place in 1990, the post-tax Gini in 1990 would have increased by only 0.057 points instead of by 0.068 points as

When focusing on changes in the tax system only, we find a contribution of the policy effect of 37 percent to the total change in the Gini.[22] This implies that changes in transfer policies to some extent counteracted the increase in inequality in that period. Similarly, Poterba (2007) calculates counterfactuals for the years 2000 and 2004. While focusing on top incomes, the author also reports changes for different quintiles. Poterba (2007) concludes that policy changes had a very minor effect compared to changes in pre–tax income inequality, which is totally in line with our results (see Table 4).

Comparing effects over time. Finally, we reconsider the questions of – first – how the overall redistributive capacity of the income tax system has changed and – second – how reforms over the whole period 1978–2009 have affected income inequality in total. Therefore, we go back to Figures 4.6.4, 4.6.6 and 4.6.7 and focus on measured redistribution (dark triangles) and the pure policy effect (hollow triangles). For the interpretation of the pure policy effect in Figures 4.6.4, 4.6.6 and 4.6.7, it is important to note that the hollow triangles in each year t show the cumulative policy effect from starting year 1978 to year t. As discussed in the introduction and shown in many contributions since Musgrave and Thin (1948), in a progressive tax system, one would expect a co–movement of tax redistribution (dark triangles) and income inequality before taxes. In other words, given no changes in the tax system between two periods, a progressive tax system cushions changes in pre–tax inequality such that the change in post–tax inequality is less pronounced.[23] In Figure 4.6.4, such a link is indeed apparent during periods when income gaps widened rapidly (1980–1982, 1989–1993 and 2009) or narrowed (late 1990s). Importantly, a comparison with the pure policy effect conveys that this "automatic" increase in redistribution has been the main (and sometimes the only)

it actually did, i.e. the policy change accounted for 16 percent of the Gini increase.

[22] Following the same line of arguing as Gramlich et al. (1993), we find that with tax policy parameters of 1980 still in place in 1990, the Gini coefficient would have increased by 0.0303 points instead of the observed rise by 0.0481 points. Thus, according to our calculations, 63 percent of the increase were due to changes in the pre-tax income distribution and 37 percent due to tax policy.

[23] This property of a progressive tax system is also known as automatic stabilization (see, e.g., Auerbach and Feenberg (2000) or Dolls et al. (2012)). Contrary, with a regressive system the change in post–tax inequality would be larger, whereas changes in pre– and post–tax inequality would be equal with a proportional system.

reason for the tax system to slow down the growth in post–tax inequality. Policy changes implemented in 1982, 1987 and the early 2000s were disequalizing, while the reforms of the late 1970s, early 1990s and 2009 made income taxes more redistributive. Over the time period as a whole, these direct effects of policy changes more or less canceled out. The results for the upper and lower parts of the distribution (Fig. 4.6.6 and 4.6.7) show that the equalizing effect of policy in the early–to–mid 1990s was a result of changes that improved the situation of low–income earners, notably the increased generosity of the EITC. By contrast, from 1982–1988, policy configurations exacerbated the income gaps in the upper part of the distribution (between the 90th and the 50th percentile), had the population and pre–tax distribution remained unchanged. The (only) reason why the tax system nevertheless compensated some of the growing pre–tax income disparities in the upper income segment is that the built–in progressivity made the tax system more redistributive as income inequalities grew – and this effect was stronger than the weakening of the redistributive effect produced by policy reforms.

Given the data quality issues discussed in section 4.3, there are good reasons for basing an analysis of longer–term trends on inequality measures that are not unduly influenced by measurement errors at the top (or the bottom) of the distribution. It is nevertheless interesting to compare the results of the decomposition of inter–quintile ratios, such as the P90/P10, with more comprehensive global inequality measures, such as the Gini coefficient. Figure 4.6.8 shows that the overall patterns are the same: a large increase in pre–tax income inequality, increased redistribution which compensates some of this disequalizing effect, and little contribution of policy changes over the period as a whole. The important difference, however, is that taxes on incomes were much less able to counter the increase in pre–tax inequality (both the policy effect and the total change in redistribution are close to zero and inequality therefore grew by about the same extent whether measured in pre– or in post–tax terms). The Gini coefficient measures income differentials in all parts of the distribution and, compared to the P90/P10 ratio, gives (much) more weight to income disparities in the middle. The fact that redistribution as measured by the Gini coefficient compensated for only about 10 percent of the increase in pre–tax inequality suggests that the tax system is less effective at countering changes in the middle (e.g., due to a "hollowing out" of the

middle classes), than at either end of the distribution.

Political cycles and inequality changes. We have seen that tax policy indeed had an inequality–increasing effect in the 1980s and early 2000s and an inequality–decreasing effect in the early 1990s and in 2009. These sub-periods can be broadly classified by Republican and Democrat administrations. Our counterfactual simulations also show that during Republican administrations average tax rates fell strongest for high income, but very little for low income households (Figure 4.6.9). This paper therefore complements analyses conducted by Bartels (2008) as the decomposition analysis enables us to control for changes in the pre–tax income distribution and hence to single out the pure policy effect. Bartels (2008) finds that under Democratic presidents real incomes grew much faster at the bottom and in the middle of the income distribution compared to Republican Administrations. He further shows that income growth was also much more equally distributed under Democratic presidents than under Republicans, where incomes of the rich increased by far the most. These findings are also visible in Figures 4.6.2–4.6.8 where increases in inequality by and large coincide with Republican presidents. This confirms the view by Krugman (2005) that partisan politics have a major impact on the income distribution. This is true not only for pre–tax but also for post–tax incomes.

4.4.3 Robustness checks

Choice of the uprating factor. An interesting question is to what extent our results depend on the choice of the uprating factor. As a sensitivity check, we replicate the analysis for the period 1986–1988 with mean nominal wage growth as uprating factor.[24] The period after TRA86 is appropriate for a robustness check for two reasons. First, the growth rates of mean nominal wages from 1986 to 1988 exceeded those of the CPI by 74 and 21 percent (6.38 vs. 3.66 percent and 4.93 vs. 4.08 percent), respectively. This was one of the largest differences between the two indices in the observation period which makes the choice of the uprating

[24] We choose the National Average Wage Index according to which the taxable maximum for Social Security is automatically adjusted. See http://www.ssa.gov/OACT/COLA/AWI.html for further information.

factor a critical decision. Second, income brackets were adjusted due to changes in tax rates, but not due to indexation. From 1986 to 1987 (1987 to 1988), the number of tax brackets fell from 15 to 5 (5 to 4), see Table 1.

Results do not change much with nominal wage indexation as can be seen in Table 3 (lower part). The policy effect is slightly smaller for the Gini and P90/P10 and identical for the other two percentile ratios. Because of the larger growth rates, 'fiscal drag' in the counterfactual scenarios (2) and (3) is stronger for wage than for price indexation as the propensity that taxpayers near the top–end of a tax bracket move in the upper bracket is higher. Hence, the inequality–increasing effect of TRA86 is marginally cushioned when uprating with wage growth.

Itemized deductions. As the CPS lacks information with regard to itemized deductions, we impute them from tax return data compiled by the Statistics of Income (SOI) division of the IRS. The imputation procedure is based on Alm et al. (2005) and consists of two steps. First, we calculate for each year and income group the share of taxpayers who itemize by building 14 income groups in the SOI data based on adjusted gross income (AGI). We follow Alm et al. (2005) and assume that there are no itemizers with incomes below $10,000. Corresponding income groups are constructed in the CPS and taxpayers are randomly drawn such that the shares of itemizers per income group match between SOI and CPS data. Second, the amount of itemized deductions is imputed by calculating itemized deductions as a share of federal AGI in the SOI data and by multiplying this share with the federal AGI of those who itemize in the CPS. With this adjustment, we rerun all our calculations.

An important result of this sensitivity check is that post–tax inequality slightly increases. The reason is that the share of itemizers increases by income group, i.e. it is more likely for taxpayers with high incomes to have itemized deductions exceeding the standard deduction. As a consequence, the measured redistribution mechanically decreases as can be seen in Figure 4.6.5.[25] The tax policy effect for

[25] We only report results for the P90/P10 ratio due to space restrictions. Results for other inequality measures as well as shares of itemizers and itemized deductions relative to adjusted gross income per income group are available from the authors upon request. The series in Figure 4.6.5 excludes all years after 2006 as we do not have access to SOI data for more recent years.

specific reform periods, however, changes only marginally (if at all) when itemized deductions are imputed. An exception is the period 1986–1988 in which the share of itemizers decreased. This was due to TRA86 which led to an increase of the standard deduction and a cut of certain itemized deductions (see Table 1 and Auten, Cilke and Randolph (1992)) limiting to some extent the inequality–increasing effect of TRA86.

Income concept. Our measure of pre–tax income includes government transfers, e.g. income from welfare (Aid to Families with Dependent Children, AFDC / Temporary Assistance for Needy Families, TANF), unemployment benefits as well as Supplemental Security Income (SSI). Alternatively, we have calculated a variant which excludes transfers from the pre–tax income measure. In this variant, pre–tax income is equal to market income which leads to an increase in pre–tax inequality as well as measured redistribution. The reason is that in this case the difference between pre– and post–tax income includes taxes *and* transfers. The tax policy effect, however, is unaffected by the change in the definition of pre–tax income.[26]

Sample selection. We additionally check if our results are sensitive to the sample selection and recalculate the analysis for the full CPS sample instead of focusing on the working-age population. The inequality measures and thus the other effect slightly deviate from our baseline results, but importantly, the policy effect is hardly affected.[27] The robustness checks thus reinforce that our results and, in particular the tax policy effect, are not sensitive to the choice of the uprating factor, the imputation of itemized deductions, the income concept and the sample selection.

[26] It would be interesting to conduct additional simulations of different transfer policies in order to single out the joint policy effect of taxes and transfers. However, this would require strong assumptions mainly with regard to eligibility when conducting policy swaps as there is only limited information in the CPS data. Therefore, this paper focuses on the redistributive role of tax policy.

[27] Results are available from the authors upon request.

4.5 Conclusion

A question of particular policy relevance is to what extent observed changes in income inequality can be attributed to direct policy action or to other factors that are less easily influenced by policy–makers. For any given household, the tax burden has a direct impact on the resources available for consumption. However, the assessment of trends in the redistributive properties of tax policies is complicated by the fact that pre–tax incomes and the population change at the same time as policy parameters. Since tax burdens depend on both incomes and population characteristics, a given tax system can become more or less effective at reducing inequalities, even if policy rules remain unchanged.

In this paper, we have asked how tax policy has affected post–tax income inequality in the U.S. from 1978 to 2009. For this purpose, we have conducted a set of comprehensive counterfactual simulations by applying – on a yearly basis – tax policy parameters of a certain base year to the pre–tax income distribution of the end year and vice versa. The decomposition analysis has enabled us to quantify the direct effect of tax policy on the post–tax income distribution. A main finding of this paper is that the measured redistribution increased over the whole time period, but this was mainly due to the pronounced increase in pre–tax inequality. The direct effects of policy changes almost canceled out. Focusing on selected time periods, we find that tax policy indeed had an inequality–increasing effect in the 1980s and early 2000s and an inequality–decreasing effect in the early 1990s and in 2009. These sub–periods can be broadly classified by Republican and Democrat administrations with disequalizing effects observed for the former and equalizing effects for the latter.

Throughout this paper, we have focused on the direct policy effect and have neglected behavioral responses to tax policy. This is done on purpose in order to isolate the pure policy effect – the effect which is controlled by the policy–maker. In future research, it would be interesting to separate the residual effect into the indirect, behavioral policy effect and a population effect. However, we argue that the latter is more important in the long-run than for the year-to-year analysis that we have conducted here. Moreover, it would be interesting to further analyze the

political economy of partisan tax politics.[28]

Against the background of a sharp increase in inequality resulting from the Great Recession and in light of the recently reached budget deal between Democrats and Republicans, one crucial question is which groups of American society will have to bear the fiscal burden of the budget cuts in the next few years. Our results have shown that tax cuts enacted in the early 2000s had an inequality-increasing effect (e.g., without the tax reforms of 2001 and 2003, inequality would have increased by a quarter less). This suggests that an expiration of the 2001/2003 tax cuts at the end of 2012 would not only lead to increased tax revenue, but also counteract the recent increase in inequality.

[28] Cf. chapter 5.

4.6 Appendix

Table 4.6.1: Tax Legislation

	1978	1979	1980	1981	1982	1983
Income Tax						
Number of tax brackets*	26	16	16	16	13	14
Lowest individual income tax rate**	14%***	14%***	14%***	13.83%***	12%***	11%***
Lowest individual income single tax bracket	$2,200-$2,700	$2,300-$3,400	$2,300-$3,400	$2,300-$3,400	$2,300-$3,400	$2,300-$3,400
Lowest individual income joint tax bracket	$3,200-$4200	$3,400-$5500	$3,400-$5,500	$3,400-$5,500	$3,400-$5,500	$3,400-$5,500
Other individual income tax brackets (percent)*, ****	15, 16, 17, 19, 22, 25, 28, 32, 36, 39, 42, 45, 48, 50, 53, 55, 58, 60, 62, 64, 66, 68, 69,	16, 18, 21, 24, 28, 32 37, 43, 49, 54, 59, 64, 68	16, 18, 21, 24, 28, 32 37, 43, 49, 54, 59, 64, 68	16, 18, 21, 24, 28, 32 37, 43, 49, 54, 59, 64, 68	14, 16, 19, 22, 25, 29, 33, 39, 44, 49	13, 15, 17, 19, 23, 26, 30, 35, 40, 44, 48
Highest individual income tax bracket rate	70%	70%	70%	70%	50%	50%
Rate on long-term capital gains	40% of individual rate, maximum 39.875%	40% of individual rate, maximum 28%	40% of individual rate, maximum 28%	40% of individual rate, maximum 20%	40% of individual rate, maximum 20%	40% of individual rate, maximum 20%
Rate on dividends	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates
Limitations on personal exemption and itemized deductions	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Standard Deduction	$2,200 (single person) / $3,200 (married couple)	$2,300 (single person) / $3,400 (married couple)	$2,300 (single person) / $3,400 (married couple)	$2,300 (single person) / $3,400 (married couple)	$2,300 (single person) / $3,400 (married couple)	$2,300 (single person) / $3,400 (married couple)
AMT exemption*****	$20,000 for joint and single filers	$20,000 for joint and single filers	$20,000 for joint and single filers	$20,000 for joint and single filers	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers

	1978	1979	1980	1981	1982	1983
Tax credits						
Child tax credit	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Child and dependent care tax credit (non-refundable)*****	$400 for each of first 2 dependents, maximum 20% of expenditures	$400 for each of first 2 dependents, maximum 20% of expenditures	$400 for each of first 2 dependents, maximum 20% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures
EITC rate and maximum credit	10%, max. $400	10%, max. $500	10%, max. $500	10%, max. $500	10%, max. $500	10%, max. $500
EITC phaseout range and rate	$6,000-$10,000, 12.5%	$6,000-$10,000, 12.5%	$6,000-$10,000, 12.5%	$6,000-$10,000, 12.5%	$6,000-$10,000, 12.5%	$6,000-$10,000, 12.5%
Social Security [a]						
Social Security tax rate (OASDI) [b]	10.1%	10.16%	10.16%	10.7%	10.8%	10.8%
Hospital Insurance tax rate (HI) [c]	2.0%	2.1%	2.1%	2.6%	2.6%	2.6%
OASDI taxable maximum earnings	17,700	22,900	25,900	29,700	32,400	35,700
HI taxable maximum earnings [d]	17,700	22,900	25,900	29,700	32,400	35,700

	1984	1985	1986	1987	1988	1989
Income Tax						
Number of tax brackets*	15	15	15	5	4	4
Lowest individual income tax rate**	11%***	11%***	11%***	11%	15%	15%
Lowest individual income single tax bracket	$2,300-$3,400	$2,390-$3,540	$2,480-$3,670	$0-$1,800	$0-$17,850	$0-$18,550
Lowest individual income joint tax bracket	$3,400-$5,500	$3,540-$5,720	$3,670-$5,940	$0-$3,000	$0-$29,750	$0-$30,950
Other individual income tax brackets (percent)*, ****	12, 14, 16, 18, 22, 25, 28, 33, 38, 42, 45, 49	12, 14, 16, 18, 22, 25, 28, 33, 38, 42, 45, 49	12, 14, 16, 18, 22, 25, 28, 33, 38, 42, 45, 49	15, 28, 35	28, 33	28, 33
Highest individual income tax bracket rate	50%	50%	50%	38.5%	28%	28%
Rate on long-term capital gains	40% of individual rate, maximum 20%	40% of individual rate, maximum 20%	40% of individual rate, maximum 20%	Ordinary rates	Ordinary rates	Ordinary rates
Rate on dividends	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates
Limitations on personal exemption and itemized deductions	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Standard Deduction	$2,300 (single person) / $3,400 (married couple)	$2,400 (single person) / $3,550 (married couple)	$2,480 (single person) / $3,670 (married couple)	$2,540 (single person) / $3,760 (married couple)	$3,000 (single person) / $5,000 (married couple)	$3,100 (single person) / $5,200 (married couple)
AMT exemption*****	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers

	1984	1985	1986	1987	1988	1989
Tax credits						
Child tax credit	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Child and dependent care tax credit (non-refundable)*****	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures
EITC rate and maximum credit	10%, max. $500	11%, max. $550	11%, max. $550	14%, max. $851, indexed for inflation	14%, max. $874	14%, max. $910
EITC phaseout range and rate	$6,000-$10,000, 12.5%	$6,500-$11,000, 12.22%	$6,500-$11,000, 12.22%	$6,920-$15,432, indexed for inflation, 10%	$9,840-$18,576, 10%	$10,240-$19,340, 10%
Social Security [a]						
Social Security tax rate (OASDI) [b]	11.4%	11.4%	11.4%	11.4%	12.12%	12.12%
Hospital Insurance tax rate (HI) [c]	2.6%	2.7%	2.9%	2.9%	2.9%	2.9%
OASDI taxable maximum earnings	37,800	39,600	42,000	43,800	45,000	48,000
HI taxable maximum earnings [d]	37,800	39,600	42,000	43,800	45,000	48,000

	1990	1991	1992	1993	1994	1995
Income Tax						
Number of tax brackets*	4	3	3	5	5	5
Lowest individual income tax rate**	15%	15%	15%	15%	15%	15%
Lowest individual income single tax bracket	$0-$19,450	$0-$20,350	$0-$21,450	$0-$22,100	$0-$22,750	$0-$23,350
Lowest individual income joint tax bracket	$0-$32,450	$0-$34,000	$0-$35,800	$0-$36,900	$0-$38,000	$0-$39,999
Other individual income tax brackets (percent)*, ****	28, 33	28	28	28, 31, 36	28, 31, 36	28, 31, 36
Highest individual income tax bracket rate	28%	31%	31%	39.6%	39.6%	39.6%
Rate on long-term capital gains	28% and 15%	28% and 15%	28% and 15%	28% and 15%	28% and 15%	28% and 15%
Rate on dividends	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates
Limitations on personal exemption and itemized deductions	N.A.	Personal exemption phases out (PEP) between $100,000 and $222,500 (single), $150,000 and $272,500 (joint). Limitation on itemized deductions (Pease) for AGI over $100,000. Thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation
Standard Deduction	$3,250 (single person) / $5,450 (married couple)	$3,400 (single person) / $5,700 (married couple)	$3,600 (single person) / $6,000 (married couple)	$3,700 (single person) / $6,200 (married couple)	$3,800 (single person) / $6,550 (married couple)	$3,900 (single person) / $6,550 (married couple)
AMT exemption*****	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers	$30,000 for single filers, $40,000 for joint filers	$33,750 for single filers, $45,000 for joint filers	$33,750 for single filers, $45,000 for joint filers

	1990	1991	1992	1993	1994	1995
Tax credits						
Child tax credit	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Child and dependent care tax credit (non-refundable)*****	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures
EITC rate and maximum credit	14%, max. $953	One child: 16.7%, maximum $1,192; two children: 17.3%, maximum $1,235	One child: 17.6%, maximum $1,324; two children: 18.4%, maximum $1,384	One child: 18.5%, maximum $1,434; two children: 19.5%, maximum $1,511	No children: 7.65%, maximum $306; one child: 26.3%, maximum $2,038; two children: 30.0%, maximum $2,528	No children: 7.65%, maximum $314; one child: 34%, maximum $2,094; two children: 36%, maximum $3,110
EITC phaseout range and rate	$10,730-$20,264, 10%	One child/two children: $11,250-$21,250, 11.93%/12.36%	One child: $11,840-$22,370, two children: $11,250-$21,250, 12.57%/13.14%	One child: $12,200-$23,050, two children: $12,200-$23,050, 13.21%/13.93%	No children: $5,000-$9,000, one child: $11,000-$23,755, two children: $11,000-$25,296, 7.65%/15.98%/17.68%	No children: $5,130-$9,230, one child: $11,290-$24,396, two children: $11,290-$26,673, 7.65%/15.98%/20.22%
Social Security [a]						
Social Security tax rate (OASDI) [b]	12.4%	12.4%	12.4%	12.4%	12.4%	12.4%
Hospital Insurance tax rate (HI) [c]	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%
OASDI taxable maximum earnings	51,300	53,400	55,500	57,600	60,600	61,200
HI taxable maximum earnings [d]	51,300	125,000	130,200	135,000	no max.	no max.

	1996	1997	1998	1999	2000	2001
Income Tax						
Number of tax brackets*	5	5	5	5	5	5
Lowest individual income tax rate**	15%	15%	15%	15%	15%	15%
Lowest individual income single tax bracket	$0-$24,000	$0-$24,650	$0-$25,350	$0-$25,750	$0-$26,250	$0-$27,050
Lowest individual income joint tax bracket	$0-$40,100	$0-$41,200	$0-$42,350	$0-$43,050	$0-$43,850	$0-$45,200
Other individual income tax brackets (percent)*, ****	28, 31, 36	28, 31, 36	28, 31, 36	28, 31, 36	28, 31, 36	27.5, 30.5, 35.5
Highest individual income tax bracket rate	39.6%	39.6%	39.6%	39.6%	39.6%	39.10%
Rate on long-term capital gains	28% and 15%	10% for tax payers in the 15% bracket or below, 20% for others	10% for tax payers in the 15% bracket or below, 20% for others	10% for tax payers in the 15% bracket or below, 20% for others	10% for tax payers in the 15% bracket or below, 20% for others	10% for tax payers in the 15% bracket or below, 20% for others
Rate on dividends	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates	= individual rates
Limitations on personal exemption and itemized deductions	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation
Standard Deduction	$4,000 (single person) / $6,700 (married couple)	$4,150 (single person) / $6,900 (married couple)	$4,250 (single person) / $7,100 (married couple)	$4,300 (single person) / $7,200 (married couple)	$4,400 (single person) / $7,350 (married couple)	$4,550 (single person) / $7,600 (married couple)
AMT exemption*****	$33,750 for single filers, $45,000 for joint filers	$33,750 for single filers, $45,000 for joint filers	$33,750 for single filers, $45,000 for joint filers	$33,750 for single filers, $45,000 for joint filers	$33,750 for single filers, $45,000 for joint filers	$35,750 for single filers, $49,000 for joint filers

	1996	1997	1998	1999	2000	2001
Tax credits						
Child tax credit	N.A.	$500 (non-refundable)	$500 (non-refundable)	$500 (non-refundable)	$500 (non-refundable)	600$, refundable up to 10% earned income above $10,000, threshold indexed for inflation
Child and dependent care tax credit (non-refundable)*****	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures	Maximum expenditure eligible for credit is $2,400 for one child, $4,800 for two or more; maximimum credit is 20%-30% of expenditures
EITC rate and maximum credit	No children: 7.65%, maximum $323; one child: 34%, maximum $2,152; two children: 40%, maximum $3,556	No children: 7.65%, maximum $332; one child: 34%, maximum $2,210; two children: 40%, maximum $3,656	No children: 7.65%, maximum $341; one child: 34%, maximum $2,271; two children: 40%, maximum $3,756	No children: 7.65%, maximum $347; one child: 34%, maximum $2,312; two children: 40%, maximum $3,816	No children: 7.65%, maximum $353; one child: 34%, maximum $2,353; two children: 40%, maximum $3,888	No children: 7.65%, maximum $364; one child: 34%, maximum $2,428; two children: 40%, maximum $4,008
EITC phaseout range and rate	No children: $5,280-$9,500, one child: $11,610-$25,078, two children: $11,610-$28,495, 7.65%/15.98%/21.06 %	No children: $5,430-$9,770, one child: $11,930-$25,650, two children: $11,930-$29,290, 7.65%/15.98%/21.06%	No children: $5,570-$10,030, one child: $12,260-$26,473, two children: $12,260-$30,095, 7.65%/15.98%/21.06%	No children: $5,670-$10,200, one child: $12,460-$26,928, two children: $12,460-$30,580, 7.65%/15.98%/21.06 %	No children: $5,770-$10,380, one child: $12,690-$27,413, two children: $12,690-$31,152, 7.65%/15.98%/21.06 %	No children: $5,950-$10,710, one child: $13,090-$28,281, two children: $13,090-$32,121, 7.65%/15.98%/21.06%
Social Security [a]						
Social Security tax rate (OASDI) [b]	12.4%	12.4%	12.4%	12.4%	12.4%	12.4%
Hospital Insurance tax rate (HI) [c]	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%
OASDI taxable maximum earnings	62,700	65,400	68,400	72,600	76,200	80,400
HI taxable maximum earnings [d]	no max.	no max.	no max.	no max.	no max.	no max.

	2002	2003	2004	2005	2006	2007
Income Tax						
Number of tax brackets*	6	6	6	6	6	6
Lowest individual income tax rate**	10%	10%	10%	10%	10%	10%
Lowest individual income single tax bracket	$0-$6,000	$0-$7,000	$0-$7,150	$0-$7,300	$0-$7,550	$0-$7,825
Lowest individual income joint tax bracket	$0-$12,000	$0-$14,000	$0-$14,300	$0-$14,600	$0-$15,100	$0-$15,650
Other individual income tax brackets (percent)*, ****	15, 27, 30, 35	15, 25, 28, 33	15, 25, 28, 33	15, 25, 28, 33	15, 25, 28, 33	15, 25, 28, 33
Highest individual income tax bracket rate	38.6%	35%	35%	35%	35%	35%
Rate on long-term capital gains	10% for tax payers in the 15% bracket or below, 20% for others	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other
Rate on dividends	= individual rates	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other brackets	5% for taxpayers in the 15% bracket; 15% for other
Limitations on personal exemption and itemized deductions	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease, thresholds indexed for inflation	PEP and Pease limits on personal exemptions and itemized deductions reduced by 1/3, thresholds indexed for inflation	PEP and Pease limits on personal exemptions and itemized deductions reduced by 1/3, thresholds indexed for inflation
Standard Deduction	$4,700 (single person) / $7,850 (married couple)	$4,750 (single person) / $9,500 (married couple)	$4,850 (single person) / $9,700 (married couple)	$5,000 (single person) / $10,000 (married couple)	$5,150 (single person) / $10,300 (married couple)	$5,350 (single person) / $10,700 (married couple)
AMT exemption*****	$35,750 for single filers, $49,000 for joint filers	$40,250 for single filers, $58,000 for joint filers	$40,250 for single filers, $58,000 for joint filers	$40,250 for single filers, $58,000 for joint filers	$42,500 for single filers, $62,550 for joint filers	$44,350 for single filers, $66,250 for joint filers

	2002	2003	2004	2005	2006	2007
Tax credits						
Child tax credit	600$, refundable up to 10% earned income above $10,350	1,000$, refundable up to 10% earned income above $10,500	1,000$, refundable up to 15% earned income above $10,750	1,000$, refundable up to 15% earned income above $11,000	1,000$, refundable up to 15% earned income above $11,300	1,000$, refundable up to 15% earned income above $11,750
Child and dependent care tax credit (non-refundable)*****	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)
EITC rate and maximum credit	No children: 7.65%, maximum $376; one child: 34%, maximum $2,506; two children: 40%, maximum $4,140	No children: 7.65%, maximum $382; one child: 34%, maximum $2,547; two children: 40%, maximum $4,204	No children: 7.65%, maximum $390; one child: 34%, maximum $2,604; two children: 40%, maximum $4,300	No children: 7.65%, maximum $399; one child: 34%, maximum $2,662; two children: 40%, maximum $4,400	No children: 7.65%, maximum $412; one child: 34%, maximum $2,747; two children: 40%, maximum $4,536	No children: 7.65%, maximum $428; one child: 34%, maximum $2,853; two children: 40%, maximum $4,716
EITC phaseout range and rate	No children: $6,150-$11,060, one child: $13,520-$29,201, two children: $13,520-$33,178. Starting/ending points increased by $1,000 for joint filers. 7.65%/15.98%/21.06%	No children: $6,240-$11,230, one child: $13,730-$29,666, two children: $13,730-$33,692. Increased by $1,000 for joint filers. 7.65%/15.98%/21.06%	No children: $6,390-$11,490, one child: $14,040-$30,338, two children: $14,040-$34,458. Increased by $1,000 for joint filers. 7.65%/15.98%/21.06%	No children: $6,530-$11,750, one child: $14,370-$31,030, two children: $14,370-$35,263. Increased by $2,000 for joint filers. 7.65%/15.98%/21.06 %	No children: $6,740-$12,120, one child: $14,810-$32,001, two children: $14,810-$36,348. Increased by $2,000 for joint filers. 7.65%/15.98%/21.06%	No children: $7,000-$12,590, one child: $15,390-$33,241, two children: $15,390-$37,783. Increased by $2,000 for joint filers. 7.65%/15.98%/ 21.06%
Social Security [a]						
Social Security tax rate (OASDI) [b]	12.4%	12.4%	12.4%	12.4%	12.4%	12.4%
Hospital Insurance tax rate (HI) [c]	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%
OASDI taxable maximum earnings	84,900	87,000	87,900	90,000	94,200	97,500
HI taxable maximum earnings [d]	no max.	no max.	no max.	no max.	no max.	no max.

	2008	2009		2008	2009
Income Tax			*Social Security [a]*		
Number of tax brackets*	6	6	Social Security tax rate (OASDI)	12.4%	12.4%
Lowest individual income tax rate**	10%	10%	Hospital Insurance tax rate (HI)	2.9%	2.9%
Lowest individual income single tax bracket	$0-$8,025	$0-$8,350	OASDI taxable maximum earnings	102,000	106,800
Lowest individual income joint tax bracket	$0-$16,050	$0-$16,700	HI taxable maximum earnings	no max.	no max.
Other individual income tax brackets (percent)*, ****	15, 25, 28, 33	15, 25, 28, 33	*Tax credits*		
Highest individual income tax bracket rate	35%	35%	Child tax credit	1,000$, refundable up to 15% earned income above $8,500	1,000$, refundable up to 15% earned income above $3,000
Rate on long-term capital gains	0% for taxpayers in the 10% and 15% bracket; 15% for other brackets	0% for taxpayers in the 10% and 15% bracket; 15% for other brackets	Child and dependent care tax credit (non-refundable)*****	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)	Maximum eligible expenses are $3,000 for 1 child; $6,000 for 2 or more; maximum credit is 35% (phasing down to 20% at $15,000 of AGI)
Rate on dividends	0% for taxpayers in the 10% and 15% bracket; 15% for other brackets	0% for taxpayers in the 10% and 15% bracket; 15% for other brackets	EITC rate and maximum credit	No children: 7.65%, maximum $438; one child: 34%, maximum $2,917; two children: 40%, maximum $4,824	No children: 7.65%, maximum $457; one child: 34%, maximum $3,043; two children: 40%, maximum $5,028; three children 45%, maximum $5,657
Limitations on personal exemption and itemized deductions	PEP and Pease limits on personal exemptions and itemized deductions reduced by 2/3, thresholds indexed for inflation	PEP and Pease limits on personal exemptions and itemized deductions reduced by 2/3, thresholds indexed for inflation	EITC phaseout range and rate	No children: $7,160-$12,880, one child: $15,740-$33,995, two children: $15,740-$38,646. Increased by $3,000 (indexed for inflation) for joint filers. 7.65%/15.98%/21.06%	No children: $7,470-$13,440, one child: $16,420-$35,463, two children: $16,420-$40,295, three children: $16,420-$43,279. Increased by $5,000 for joint filers. 7.65%/15.98%/21.06%/21.06%
Standard Deduction	$5,450 (single person) / $10,900 (married couple)	$5,700 (single person) / $11,400 (married couple)			
AMT exemption*****	$46,200 for single filers, $69,950 for joint filers	$46,700 for single filers, $70,950 for joint filers			

Notes:
* Married couple filing jointly
** Indexing of income brackets for individual income tax began in 1985 under ERTA81 except for 1987 and 1988 when brackets were not indexed because of rate changes; Changes in bracket amounts for 1985-1986, 1989-2000, and 2004-2007 occured as a result of indexing for inflation rather than from a change in tax legislation
*** 0% rate existed below these brackets until 1986
**** For years 1988-1990 rate applicable to highest income bracket is not the highest rate: 28% rate is applicable to two income brackets - the highest bracket and a lower one
***** Not indexed for inflation
[a] The taxable maximum for 1979-81 was set by statute; all other amounts were determined under automatic adjustment provisions of the Social Security Act according to the national average wage index. The tax rate refers to the combined rate for employers and employees.
[b] OASDI: Old-Age, Survivors, and Disability Insurance program
[c] HI: Medicare's Hospital Insurance program
[d] The upper limit on earnings subject to HI was repealed by the Omnibus Budget Reconciliation Act of 1993.
Sources: Tax Policy Center (http://www.taxpolicycenter.org/taxfacts/index.cfm), Social Security Administration (http://www.ssa.gov/OACT/COLA/cbb.html and http://www.ssa.gov/OACT/ProgData/taxRates.html), last accessed May 2011

Table 4.6.2: Decomposing changes in income distribution over time

data year:	1978	1978	1980	1978	1980		Decomposition I		Decomposition II		Shorrocks-Shapley Decomposition	
uprated to:		1980		1980		Total change						
policy year:	1978	1978	1978	1980	1980		Tax policy effect	Other effect	Tax policy effect	Other effect	Tax policy effect	Other effect
uprated to:		1980	1980									
	(0)	(1)	(2)	(3)	(4)	(4)-(0)	(4)-(2)	(2)-(1)	(3)-(1)	(4)-(3)	Mean of (4)-(2), (3)-(1)	Mean of (2)-(1), (4)-(3)
Inequality												
Gini	29.70	29.70	30.96	29.10	30.38	0.68	-0.58	1.26	-0.60	1.28	-0.59	1.27
P90/P10	4.63	4.63	4.90	4.48	4.78	0.15	-0.12	0.26	-0.15	0.30	-0.13	0.28
P90/P50	1.82	1.82	1.87	1.79	1.84	0.01	-0.03	0.04	-0.03	0.05	-0.03	0.05
P50/P10	2.54	2.54	2.62	2.50	2.60	0.06	-0.02	0.08	-0.04	0.10	-0.03	0.09

Measures are based on equivalized income using the square-root of household size scale. Gini multiplied by 100. Uprating according the level of price inflation.

data year:	1981	1981	1984	1981	1984		Decomposition I		Decomposition II		Shorrocks-Shapley Decomposition	
uprated to:		1984		1984		Total change						
policy year:	1981	1981	1981	1984	1984		Tax policy effect	Other effect	Tax policy effect	Other effect	Tax policy effect	Other effect
uprated to:		1984	1984									
	(0)	(1)	(2)	(3)	(4)	(4)-(0)	(4)-(2)	(2)-(1)	(3)-(1)	(4)-(3)	Mean of (4)-(2), (3)-(1)	Mean of (2)-(1), (4)-(3)
Inequality												
Gini	30.86	30.86	32.30	31.86	33.28	2.42	0.98	1.44	1.00	1.42	0.99	1.43
P90/P10	4.94	4.94	5.46	5.30	5.77	0.83	0.31	0.53	0.36	0.47	0.33	0.50
P90/P50	1.83	1.83	1.90	1.89	1.96	0.12	0.05	0.07	0.06	0.06	0.06	0.07
P50/P10	2.69	2.69	2.87	2.79	2.95	0.26	0.09	0.17	0.10	0.16	0.09	0.17

Measures are based on equivalized income using the square-root of household size scale. Gini multiplied by 100. Uprating according the level of price inflation.

Table 4.6.3: Decomposing changes in income distribution over time (cont.)

data year:	1986	1986	1988	1986	1988		Decomposition I		Decomposition II		Shorrocks-Shapley Decomposition	
uprated to:		1988		1988		Total change						
policy year:	1986	1986	1986	1988	1988		Tax policy effect	Other effect	Tax policy effect	Other effect	Tax policy effect	Other effect
uprated to:		1988	1988									
	(0)	(1)	(2)	(3)	(4)	(4)-(0)	(4)-(2)	(2)-(1)	(3)-(1)	(4)-(3)	Mean of (4)-(2), (3)-(1)	Mean of (2)-(1), (4)-(3)
Inequality												
Gini	33.75	33.75	34.07	34.76	35.09	1.34	1.02	0.32	1.01	0.33	1.02	0.32
P90/P10	5.87	5.87	5.93	5.98	6.02	0.15	0.09	0.06	0.12	0.03	0.10	0.05
P90/P50	1.96	1.96	1.98	2.00	2.02	0.06	0.04	0.02	0.04	0.02	0.04	0.02
P50/P10	3.00	3.00	3.00	2.99	2.98	-0.02	-0.02	0.00	-0.01	-0.01	-0.01	0.00

Measures are based on equivalized income using the square-root of household size scale. Gini multiplied by 100. Uprating according the level of price inflation.

data year:	1986	1986	1988	1986	1988		Decomposition I		Decomposition II		Shorrocks-Shapley Decomposition	
uprated to:		1988		1988		Total change						
policy year:	1986	1986	1986	1988	1988		Tax policy effect	Other effect	Tax policy effect	Other effect	Tax policy effect	Other effect
uprated to:		1988	1988									
	(0)	(1)	(2)	(3)	(4)	(4)-(0)	(4)-(2)	(2)-(1)	(3)-(1)	(4)-(3)	Mean of (4)-(2), (3)-(1)	Mean of (2)-(1), (4)-(3)
Inequality												
Gini	33.75	33.75	34.10	34.72	35.09	1.34	0.99	0.35	0.97	0.37	0.98	0.36
P90/P10	5.87	5.87	5.93	5.96	6.02	0.15	0.08	0.07	0.09	0.06	0.09	0.06
P90/P50	1.96	1.96	1.98	2.00	2.02	0.06	0.04	0.02	0.04	0.02	0.04	0.02
P50/P10	3.00	3.00	3.00	2.98	2.98	-0.02	-0.01	0.00	-0.01	0.00	-0.01	0.00

Measures are based on equivalized income using the square-root of household size scale. Gini multiplied by 100. Uprating according to the level of mean nominal earnings growth.

Table 4.6.4: Decomposing changes in income distribution over time (cont.)

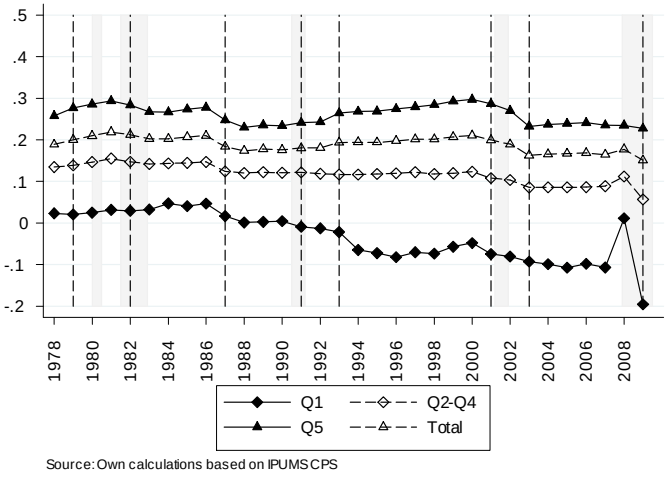
data year:	1989	1989	1994	1989	1994		Decomposition I		Decomposition II		Shorrocks-Shapley Decomposition	
uprated to:		1994		1994		Total change						
policy year:	1989	1989	1989	1994	1994		Tax policy effect	Other effect	Tax policy effect	Other effect	Tax policy effect	Other effect
uprated to:		1994	1994									
	(0)	(1)	(2)	(3)	(4)	(4)-(0)	(4)-(2)	(2)-(1)	(3)-(1)	(4)-(3)	Mean of (4)-(2), (3)-(1)	Mean of (2)-(1), (4)-(3)
Inequality												
Gini	35.38	35.38	37.20	34.69	36.64	1.26	-0.56	1.82	-0.69	1.95	-0.63	1.89
P90/P10	5.87	5.87	6.43	5.61	6.13	0.26	-0.30	0.57	-0.26	0.52	-0.28	0.54
P90/P50	2.02	2.02	2.09	2.01	2.09	0.07	-0.01	0.07	-0.01	0.07	-0.01	0.07
P50/P10	2.90	2.90	3.07	2.79	2.94	0.03	-0.14	0.17	-0.11	0.15	-0.12	0.16

Measures are based on equivalized income using the square-root of household size scale. Gini multiplied by 100. Uprating according the level of price inflation.

data year:	2000	2000	2004	2000	2004		Decomposition I		Decomposition II		Shorrocks-Shapley Decomposition	
uprated to:		2004		2004		Total change						
policy year:	2000	2000	2000	2004	2004		Tax policy effect	Other effect	Tax policy effect	Other effect	Tax policy effect	Other effect
uprated to:		2004	2004									
	(0)	(1)	(2)	(3)	(4)	(4)-(0)	(4)-(2)	(2)-(1)	(3)-(1)	(4)-(3)	Mean of (4)-(2), (3)-(1)	Mean of (2)-(1), (4)-(3)
Inequality												
Gini	35.86	35.86	37.25	36.12	37.57	1.71	0.32	1.39	0.26	1.45	0.29	1.42
P90/P10	5.53	5.53	5.99	5.61	6.03	0.51	0.04	0.46	0.08	0.43	0.06	0.44
P90/P50	2.05	2.05	2.12	2.08	2.14	0.09	0.02	0.06	0.02	0.06	0.02	0.06
P50/P10	2.69	2.69	2.83	2.70	2.82	0.13	-0.01	0.14	0.01	0.12	0.00	0.13

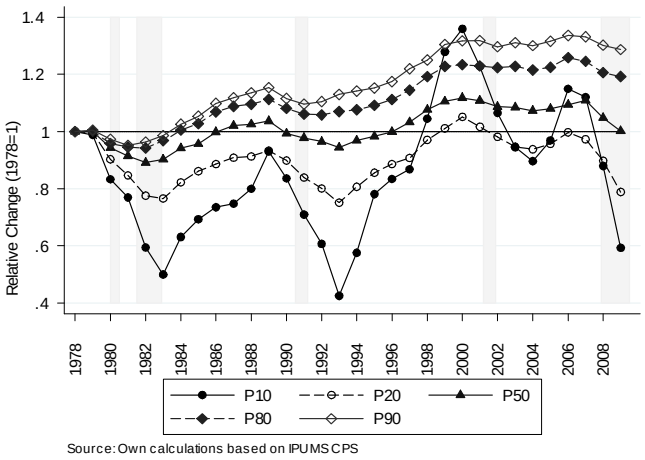
Measures are based on equivalized income using the square-root of household size scale. Gini multiplied by 100. Uprating according the level of price inflation.

Figure 4.6.1: Average tax rates 1978-2009



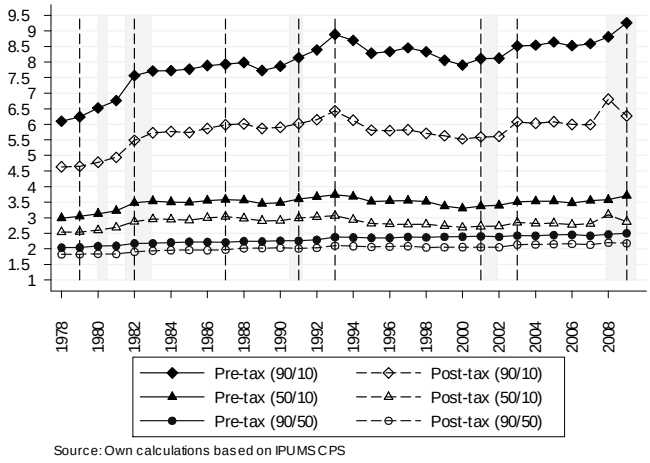
Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.2: Trends in market income



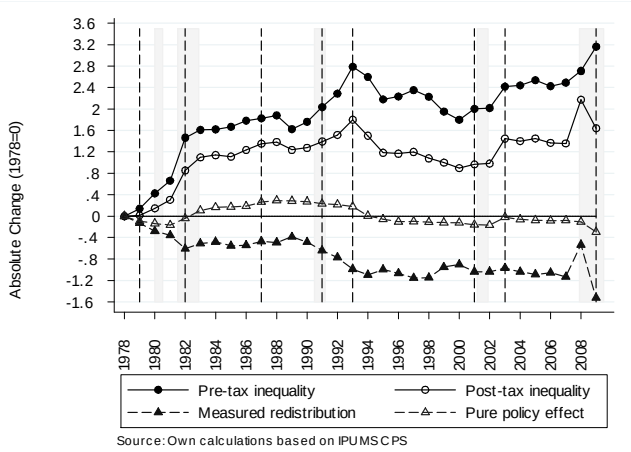
Note: Change in market income (i.e., labor + capital income) relative to base year 1978. Shaded areas show recession periods (NBER classification).

Figure 4.6.3: Income inequality 1978-2009



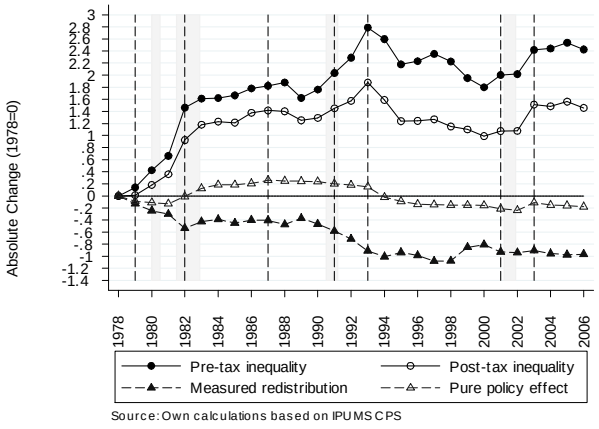
Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.4: Absolute inequality and redistribution trends - 90/10



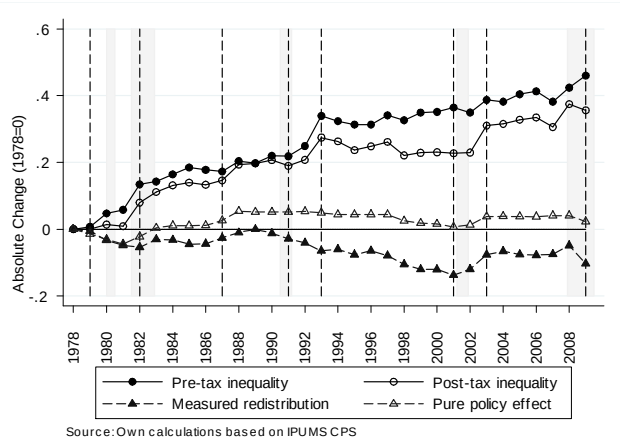
Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.5: Absolute inequality and redistribution trends - 90/10 - Imputation of itemized deductions. 1978–2006



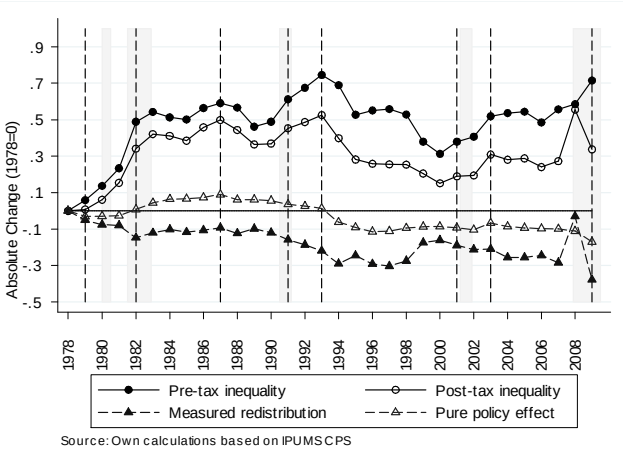
Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.6: Absolute inequality and redistribution trends - 90/50



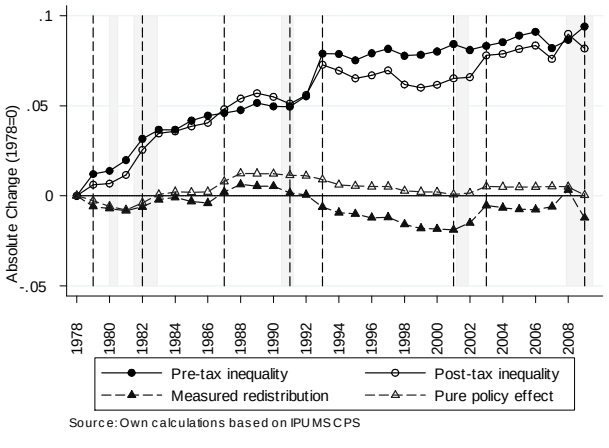
Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.7: Absolute inequality and redistribution trends - 50/10



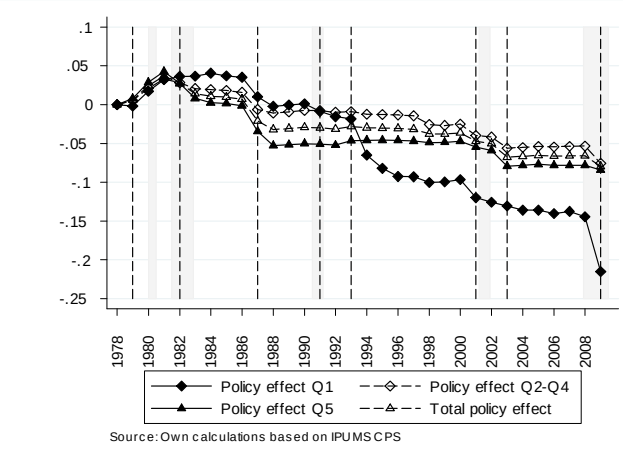
Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.8: Absolute inequality and redistribution trends - Gini



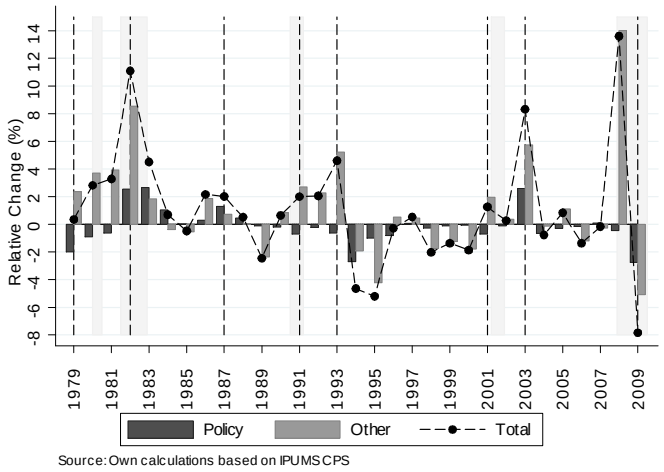
Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.9: Policy effect on average tax rates



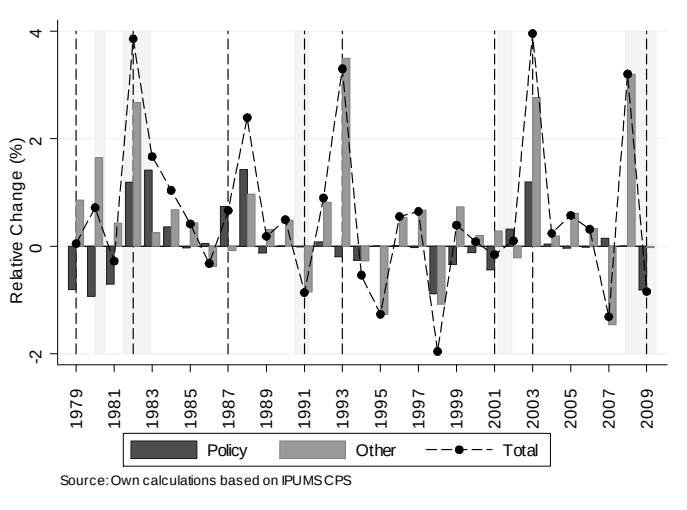
Note: The series show the cumulative policy effect on average tax rates in percentage points. The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.10: Shapley-value policy and other effects 90/10



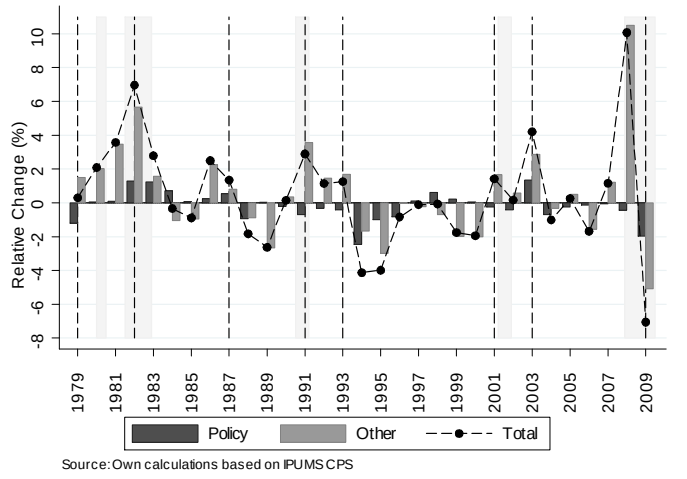
Note: Figure shows direct policy and other effect. Interpretation of policy effect: Hypothetical percentage change in post–tax income inequality compared to the previous year if only tax parameters, tax base or brackets had changed. Other effect: Hypothetical percentage change in post–tax income inequality compared to the previous year if only the pre–tax income distribution had changed, but policy parameters were fixed. The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Figure 4.6.11: Shapley-value policy and other effects 90/50



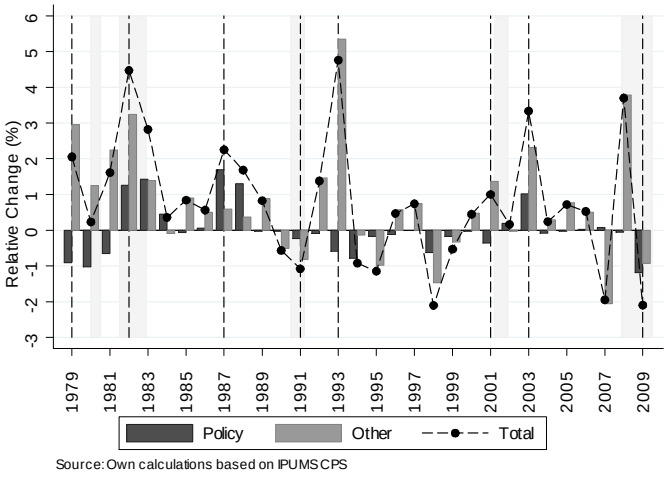
Note: Figure shows direct policy and other effect, see Figure 8.

Figure 4.6.12: Shapley-value policy and other effects 50/10



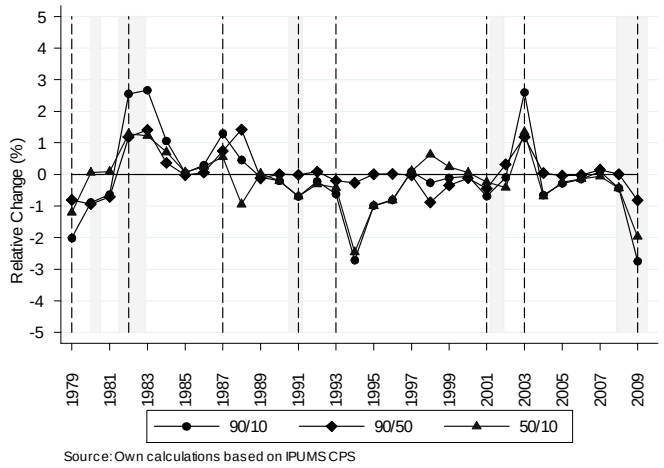
Note: Figure shows direct policy and other effect, see Figure 8.

Figure 4.6.13: Shapley-value policy and other effects Gini



Note: Figure shows direct policy and other effect, see Figure 8.

Figure 4.6.14: Shapley-value policy effect



Note: Figure shows direct policy effect for all three inequality measures, see Figure 8.

Chapter 5

Stabilization, redistribution and the political cycle in the US

5.1 Introduction

The previous chapter has shown that US tax reforms and their impact on the income distribution can be grouped in certain subperiods. The direct effect of tax policy on income inequality reported in chapter 4 follows the political cycle with a cushioning (aggravating) effect observed under Democratic (Republican) administrations. These trends have prompted both US economists as well as political scientists to emphasize the large impact of partisan politics on the income distribution.[1] Given that public debates on income inequality are often ideologically overloaded, it is important that academic research contributes to a better understanding of the forces at work.

The following analysis focuses on the direct link between partisan politics, stabilization and redistribution in the US. We first show how automatic stabilizers in the US have developed over the last three decades. We then investigate the impact of partisan politics on three distinct measures which characterize the stabilizing and redistributive capacity of the income tax system. In particular, we test the hypothesis if policies enacted by Democratic and Republican administra-

[1] See e.g. Krugman (2005) or Bartels (2008) who argues that income inequality dramatically increased under Republican administrations, but was attenuated under Democratic administrations.

tions significantly differ from each other. We exploit the institutional design that redistribution in the US occurs both on the federal and the state level and base our analysis on a thirty year panel of US states. Indeed, tax and progressivity levels differ substantially across states and over time which makes the US states a suitable laboratory for such an analysis. Furthermore, by now and in contrast to the majority of European countries, redistribution in the US is mainly achieved through the tax system and only to a smaller extent by cash transfers.[2]

We assess to what extent tax levels, automatic stabilizers and inequality are influenced by Democratic and Republican governments. Thereby, we use state tax burdens as a proxy for tax levels, income stabilization coefficients (cf. chapters 2 and 3) as a measure for income insurance and the policy effect on inequality (cf. chapter 4) as an indicator for the impact of partisan politics on inequality. While the former two indicators are influenced by changes in both tax policy and the pre-tax income distribution, the latter measure is solely affected by policy changes and thus under direct control of the government. By quantifying the policy effect on inequality and income stabilization for each state separately, our analysis contributes to the recent US fiscal federalism literature which considers the role of US states in redistribution.[3] We then consider the relationship between the political cycle and our measures for stabilization and redistribution and add to the literature on partisan effects.

The remainder of this chapter is structured as follows. In section 2, we show how automatic stabilizers in the US have developed over time. Section 3 briefly reviews the recent literature on fiscal federalism and state level redistribution in the US as well as the literature on partisan politics and economic outcomes. In section 4, we present the data and our empirical approach. Results are discussed in section 5. Section 6 concludes.

[2] Cf. Blank (2002) and Eissa and Hoynes (2011).

[3] Cf. Baicker, Clemens and Singhal (2012), Gordon and Cullen (2012), Grant, Koulovatioanos, Michaelides and Padula (2010) and Hoynes and Luttmer (2011).

5.2 Automatic Stabilizers in the US, 1978-2010

5.2.1 Overall stabilization

Figure 5.7.1 shows how automatic stabilization of disposable income through the US income tax system has changed in the period 1978 to 2010. These time series extend those reported by Auerbach and Feenberg (2000) and Auerbach (2009) to more recent years and additionally include state level taxes. As a measure for automatic stabilization, we calculate the income stabilization coefficient as described in chapter 2 and decompose it into its components income and payroll taxes (FICA). As in chapter 4, we use CPS data and the TAXSIM calculator for our computations.[4] Note that both federal and state level income taxes which are calculated after credits such as the Earned Income Tax Credit (EITC) or child credits are deducted contribute to overall stabilization. Over the whole time period, average income stabilization due to the EITC (not shown separately) which was enacted in 1975 and significantly expanded in the 1990s is below 1 percent. Interestingly, the relative importance of the single components in smoothing income shocks has changed substantially over the observed period. While the role of the federal income tax has decreased, this reduction in the shock absorption capacity of the tax system has partly been compensated by the growing importance of the payroll tax. The stabilizing role of state level income taxes has also slightly risen over the observed period.

Comparing the time series in Figure 5.7.1 to those presented in chapter 4 (Figures 4.6.4–4.6.8), one can conclude that tax reforms which caused post-tax inequality to rise (ERTA81, TRA86, EGTRRA01 and JGTRRA03) weakened automatic stabilizers whereas the opposite effect can be observed for tax reforms with an inequality-decreasing effect (RA78, OBRA90 and OBRA93). Changes in tax progressivity, in particular those caused by declining marginal tax rates in the 1980s and early 2000s, are a key driver of the reduced stabilizing capacity of the US

[4] Simulations for the US in chapter 2 were based on the Survey of Consumer Finance. Compared with the CPS, that survey has richer information with respect to household finances and credit constraints which are crucial for the estimation of demand stabilization. For an assessment of the robustness of our results, it is reassuring that in the corresponding year 2007 the level of income stabilization is almost identical for both data sources.

federal income tax.[5] This trend was only partly moderated in the 1990s when rising marginal rates increased progressivity and thus strengthened automatic stabilizers. Hence, when the US was hit by the Great Recession at the end of 2007, automatic stabilizers were at a historically low level which might be one important explanatory factor for the considerable use of discretionary fiscal policy in the US in recent periods (cf. Auerbach (2009)).

5.2.2 State decomposition

Summary statistics of income stabilization coefficients for earch state and for the whole sample period are shown in Tables 5.7.1 and 5.7.2. As in Figure 5.7.1, overall income stabilization is decomposed into its components federal and state level income taxes and social insurance contributions. In fact states only have discretion over state level income taxes, and these account for the largest part of variation which is exploited in the subsequent analysis. However, income stabilization by federal income and payroll taxes also varies across states due to different income distributions across states and over time.[6] The states levy taxes on income with varying degrees of progressivity. For example, there is a large heterogeneity across states with respect to the lowest and highest tax rates, the number and range of income brackets and the amount of personal exemptions (Tax Policy Center (2012)). In 2010, the most recent year of our sample, seven states did not levy taxes on income at all (Alaska, Florida, Nevada, South Dakota, Texas, Washington and Wyoming) and two states limited taxes to dividends and interest income (New Hampshire, Tennessee). These are the states which have on average the lowest level of income stabilization over the sample period whereas those states which had the highest marginal rates in 2010 (California, Hawaii, New Jersey, Oregon and Rhode Island – all close to 10 per cent) tend to have above average levels

[5] See Kniesner and Ziliak (2002b) who estimate that ERTA81 and TRA86 reduced consumption stability by about 50 percent.

[6] Note that the potential stabilizing effect of sales taxes which differ across states could also be incorporated into the existing framework. However, this would require to shift the focus from income to demand stabilization which is beyond the scope of this chapter (see chapter 2 for how consumption taxes can stabilize household consumption). A further challenge would be to deal with the issue of cross-border shopping as sales taxes are paid at the place of sale rather than residence.

of income stabilization. Other states (Colorado, Illinois, Indiana, Massachuesetts, Michigan, Pennsylvania and Utah) did have a flat-rate income tax in 2010 with tax rates ranging from 3 (Illinois) to 5.3 per cent (Massachusetts). Hawaii and Missouri were the states with the highest number of income brackets (12) in 2010. Personal exemptions in 2010 ranged from zero (Colorado and Pennsylvania) to 13,000 dollars for singles and 26,000 dollars for couples in Connecticut. To a large extent, differences in the total level of income stabilization across states are due to these variations in state income taxation.

5.3 Literature

One central question in a fiscal federation is to what extent state and local governments should engage in redistribution. The traditional view is that redistribution should occur (mainly) on the federal level as redistributive policies by state and local governments can be hampered by mobility responses.[7] The argument is that as a response to an increase in taxes in one state, individuals with high wages will migrate to other states with lower taxes which in turn induces gross wages for their skill level to rise in the high tax state. As a consequence, net wages are unaffected by state tax policy.[8] Against this theoretical presumption, the fiscal federalism landscape in the US is characterized by a tremendous growth in state budgets during the last decades and a substantial degree of redistribution taking place on the state level. There is a growing literature which discusses the rationale for the greater role of US states in areas such as taxation, health and public welfare. Changes in intergovernmental interactions such as an incentivization of state own-source spending by the federal government (Baicker et al. (2012)), negative vertical externalities on the federal government which offset the positive horizontal fiscal externalities of state level taxation on other states (Gordon and Cullen (2012))

[7] See e.g. early fiscal federalism models by Oates (1972) and Musgrave (1959).

[8] Feldstein and Wrobel (1998) provide empirical evidence for the US states that gross wages adjust rapidly after changes in tax policy and hence, net wages cannot be altered by state tax policies. They conclude that states cannot redistribute incomes and hence for state governments no trade-off between equity and efficiency exists. Other studies, however, find much more modest or even no cross-state migration effects resulting from heterogeneous tax and transfer policies across states (see e.g. Bakija and Slemrod (2004) and Leigh (2008a)).

and insurance effects through state taxes and transfers that potentially mitigate the incentives for mobility (Hoynes and Luttmer (2011) and Grant et al. (2010)) are important explanations for the observed trends in state revenue and spending patterns.

The second strand of literature to which our study directly relates examines the relationship between partisan politics, economic policy and macroeconomic outcomes.[9] One critical factor for the identification of partisan effects is the non-random selection of political parties. For example, the electorate might favor certain parties depending on the economic conditions which prevail at the election date or are expected for the future. Hence, an omitted variables problem might exist due to unmeasured or unobservable voter preferences which can cause a bias in regressions of party control on economic outcomes. Therefore, depending on the research design one has to be careful in interpreting any correlations between partisan politics and economic outcomes as causal.

Different empirical approaches have been used to overcome the inherent endogeneity problems of party control. One strand of the literature tries to establish a quasi-experimental design by applying the regression-discontinuity (RD) approach in order to get close to a (hypothetical) setting with randomization of the ruling political parties. Conducting a randomized experiment based on a RD design in the context of partisan politics has been introduced by Lee, Moretti and Butler (2004) and Lee (2008).[10] Lee et al. (2004) analyze voting records of Democratic and Republican members of Congress in the US House of Representatives by exploiting the institutional design that party control changes sharply at 50 per cent of the vote share.[11] Testing the hypothesis of complete divergence versus partial convergence of policy choices, the authors find that the degree of electoral strength

[9] See e.g. Besley and Case (2003) for a survey on how political institutions in the US states affect policy outcomes.

[10] Imbens and Lemieux (2008) and Lee and Lemieux (2010) provide a general discussion of this identification strategy and illustrate potential applications.

[11] A quasi-experimental design is established by comparing outcomes for units whose values of an underlying *forcing variable* are close - either just above or below - to a pre-determined threshold. These units are exptected to have similar characteristics in terms of observables, with the exception of treatment, i.e. those units with values just below the threshold provide the counterfactual outcome for those units with values just above the threshold. In the setting in Lee et al. (2004) the units are legislators in the US House and the forcing variable is the vote share they received.

does not affect a legislator's voting behavior which indicates that voters merely elect policies.[12] Lee (2008) assesses the validity of the RD design in an analysis of US House elections and shows under which conditions causal inference from this approach can be as credible as from a randomized experiment. Pettersson-Lidbom (2008) applies the RD approach to a panel of Swedish local governments and finds spending and tax levels to be 2-3 per cent higher under leftist governments. Magalhaes (2011) uses slim majorities in US state lower Houses instead of close elections as the forcing variable. At the 50 per cent cutoff, he does not find a jump in the state tax level, but confirms a general positive relationship between Democratic control of the state House and the tax level.

Other studies in this field rely on panel data methods which are sometimes combined with instrumental variables estimation techniques. Leigh (2008b) considers close elections of gubernatorial candidates, but does not find tax levels to be higher under Democratic Governors.[13] Reed (2006) estimates for a 40-year panel of US states that a 5-year Democrat control of the legislature is associated with a 3-5 percent higher state tax burden compared with a Republican control. In line with Leigh (2008b), he does not find a sizeable impact of the political party of the governor. One feature of the work by Reed (2006) is that he controls for a large set of state and voter characteristics in order to avoid problems of omitted variable bias. Besley, Persson and Sturm (2010) suggest that the degree of political competition is a further important channel through which tax levels might be affected. For a panel of US states they find that stronger political competition is associated with growth-friendly policy choices including lower taxes.

[12] In a similar vein, Fredriksson, Wang and Warren (2010) consider the effect of gubernatorial electoral outcomes on state tax policy and additionally account for governors' lame duck terms. Their results suggest that voters both elect and affect income tax policy.

[13] Note that Leigh (2008b) also uses the RD design in one of his specifications, but with a wide range of observations around the 50 per cent cut-off. This does not make his approach comparable to those RD studies cited above.

5.4 Data and methodology

5.4.1 Empirical model

We estimate a set of regressions for the US states as in Reed (2006) and extend his model with regard to the time period considered as well as the scope of the analysis. In a first step, we investigate the partisan effect on the state tax burden and on automatic stabilization. We follow Reed (2006) and collapse our sample period into 5-year intervals and build averages for all explanatory variables (i.e. political party variables and state characteristic variables) for the respective intervals.[14] As Reed (2006) argues the reason for aggregating the data is that economic outcomes are affected by partisan politics typically with some time lag which might differ across states and time periods. Following this logic, the focus on 5-year aggregates should reduce the likelihood of specification errors. The dependent variables state tax burden and income stabilization are measured at the end of each 5-year period and all political party and state characteristic variables are lagged by one period.

In a second step, we investigate the partisan effect on income inequality. For this analysis, we rely on the direct policy effect which has been introduced in chapter 4 for the federal level. We apply the same methodology here for the state level. Compared with the state tax burden and the income stabilization coefficient, the policy effect is a more direct measure for the redistributiveness of the tax system. It isolates changes in inequality induced by tax policy from those caused by changes in the distribution of pre-tax incomes with the former representing one important part of institutions and the latter the role of market forces. We argue that yearly data are the preferred specification for this kind of analysis as the policy effect is measured in annual changes rather than levels. All independent variables are again lagged by one period.

Our regression model is based on the baseline specification in Reed (2006) and includes state and time fixed effects:

[14] In section 5 we check the sensitivity of the results with regard to the choice of time intervals.

$$y_{st} = \alpha + \sum_i \beta_i \text{ Political Party Variable}_{i,st} + \sum_i \gamma_i \text{State Characteristics Variable}_{j,st} + \text{Initial Tax Burden} + \text{State FE} + \text{Time FE} + \varepsilon_{st} \quad (5.4.1)$$

with $t = 1983, 1988, ..., 2008$ in case of 5-year intervals and $t = 1979, 1980, ..., 2008$ in case of yearly data. This model is estimated using state tax burden, our measure of automatic stabilization – the income stabilization coefficient – and the tax policy effect on inequality as dependent variable y_{st}.

5.4.2 Data

Summary statistics of the variables used in the subsequent analysis are shown in Table 5.7.3.[15] It updates Table 1 in Reed (2006) to the period 1978-2008 and extends it by other variables used in our analysis, in particular by the income stabilization coefficient and the policy effect on different inequality measures.

State tax burden is the ratio of total state and local tax revenue to state personal income. The mean of this ratio is slightly larger than 10 per cent in our sample period. The respective mean value for the income stabilization coefficient is roughly 33 percent. Contrary to the first two dependent variables, the policy effect is measured in annual changes and can be interpreted as the component of a change in a given inequality measure which is due to changes in tax legislation. Mean values for the policy effect on the P90/P10 and P50/P10 ratio are negative, whereas they are positive for the P90/P50 ratio and the Gini. How large is the policy effect relative to the total change in post-tax inequality? For the P90/P10 ratio, for example, the mean annual change due to changes in tax policy is -0.004 percentage points. Given an average yearly increase of the P90/P10 ratio of 0.06, the policy effect to a small extent counteracts the increase in pre-tax income inequality.

We use party control of both the executive and the legislative branch as indicators for the impact of political parties. Democratic (Republican) Legislature is a dummy variable which is 1 if Democrats (Republicans) control both cham-

[15] An overview on data sources is given in the Appendix.

bers of the state legislature with the residual category being split control between both parties. On average, Democrats controlled both chambers roughly half the time and Republicans slightly more than a quarter. Democratic Governor is the political party variable which acccounts for the gubernatorial influence. Since in the vast majority of cases the governor is either a Democrat or a Republican, the residual category can be interpreted as Republican Governor. The ADA variable is an interest group score for each state's US House representatives and senators and shall control for the voters' policy preferences which are represented at the federal level by their state's federal legislators. The log of real per capita personal income (PCPI) is measured in constant 1999 dollars and accounts for income differentials across states. The initial tax burden at the beginning of a given time interval is included in order to account for yardstick competition (Besley and Case (1995)). Further control variables – percent elderly, percent black, percent female, percent college-ecudated, percent union, population density, farm share, manufacturing share – are included in our regressions in order to account for state and voter characteristics. For the sake of comparability, we also follow Reed (2006) in the selection of states and do not include Alaska, Hawaii, Nebraska, Minnesota and Wyoming as these states differ from the other states in terms of their political institutions or other core variables used in the analysis. The sample thus includes 45 states.

5.5 Partisan effects

5.5.1 Tax burden and income insurance

Baseline. Regression results are shown in Table 5.7.4. Column (1) is taken from Reed (2006) (Table 2, Equation C, for the years 1960-2000) while columns (2) and (3) show estimation results from our thirty-year sample ranging from 1978-2008. First compare columns (1) and (2) with the state tax burden as dependent variable. The only difference between these models is the time period considered. We confirm Reed's finding that the state tax burden is significantly higher if Democrats control both chambers of the state legislature for a period of five consecutive years relative to split control. The coefficient on Democratic Legislature – albeit

slightly smaller than in Reed's sample – is positive and significant at the 5%-level.

In both specifications, the coefficient on Democratic Legislature is not only statistically significant, but also economically important. It implies that state tax burden would be 0.33 (0.23) percentage points higher after a 5-year period of Democratic control of the state legislature compared with split control. The difference between the coefficients for Democratic and Republican Legislature in columns (1) and (2) indicates that state tax burden would increase by 0.31 (0.29) percentage points after a switch from Republican to Democratic control of the state legislature. The estimated partisan control effects should be compared with the average 5-year change in state tax burden which is 0.19 (0.08) percentage points in Reed's (our) sample. Thus, in our sample the partisan effect leads to a change in state tax burden which is almost 4 times as large as the average change. If the estimated change in tax burden is evaluated relative to its mean value, one can conclude that the state tax burden would increase by roughly 3% after a switch from Republican to Democratic control of the state legislature. The null hypothesis that the coefficient for Democratic Legislature is equal to the one for Republican Legislature can be rejected in Reed's (our) sample at the 5% (1%) level.

Interestingly, the coefficient on the log of per capita personal income is negative and significant at the 5%-level both in Reed's and in our sample. However, it can be suspected that income is endogenous to taxes which would cause a bias in the OLS estimate. The issue of endogeneity will be addressed below. The coefficient on the initial tax burden is larger than zero, but smaller than 1 implying convergence of tax burdens. With a few exceptions, coefficient estimates for the other control variables are close to the ones in Reed (2006).

In column (3), we estimate the same model as in (2), but with the income stabilization coefficient instead of state tax burden as dependent variable (cf. Tables 5.7.1 and 5.7.2). The coefficient for Democratic Legislature is positive and statistically significant at the 1%-level. The difference between the coefficients for Democratic and Republican Legislature implies that income stabilization would increase by 0.59 percentage points after a switch from Republican to Democratic control of the state legislature. This is more than twice as large as the average change of 0.26 percentage points in income stabilization after a 5-year period. Relative to its mean value, our estimates imply that income stabilization would

increase by roughly 2% after a switch from Republican to Democratic control of the state legislature. The adjusted R-squared of 0.94 is slightly higher than in the specification with state tax burden as dependent variable.[16] The null hypothesis that the coefficients on Democratic and Republican Legislatures are equal can be rejected at the 1%-level.

IV estimation. The empirical evidence on the relationship between income and taxes points to the fact that income is endogenous to taxes.[17] Reed (2006) argues that besides income further state characteristic variables could depend on the state tax burden and instruments the following variables by their initial values: log of real PCPI, percent elderly, percent black, percent female, percent college-educated, percent union, population density, farm share, and manufacturing share.[18] However, Reed (2006) does not report first-stage summary statistics on the excluded instruments such as the partial R-squared or the F-statistic which are important statistics in order to assess if a weak instrument problem might exist (Bound, Jaeger and Baker (1995)). We investigate this issue and find rather low values for the partial R-squared and the F-statistic in some of the first-stage regressions (cf. Table 5.7.5). This indicates that a problem of weak instruments might indeed exist in this context. Therefore, in all subsequent two-stage least squares regressions we treat the log of real per-capita income as the only endogenous regressor and instrument the 5-year averages by their initial values at the beginning of a given 5-year interval.[19]

How do results change when we account for the potential endogeneity of income? Results of IV-estimations are reported in Table 5.7.6. As can be seen in the first two rows, the coefficients on the political party variables change only marginally, if at all. Their significance level does not change either. The null hypothesis

[16] The high values for the adjusted R-squared in columns (1)-(3) suggest that the chosen specification including a broad set of control variables as well as time and state fixed effects is able to explain a large part of the variation in the dependent variable.

[17] Cf. Saez et al. (2012) for a recent survey of the literature on the elasticity of taxable income.

[18] More precisely, Reed (2006) instruments the 5-year average of a given state characteristic variable by its initial value at the beginning of the 5-year interval.

[19] Note that in a robustness check Reed (2006) reports IV estimation results with the log of real per-capita personal income as the only endogenous regressor. He finds that results are largely unaffected by restricting the set of endogenous regressors to income.

that the coefficient for Democratic Legislature is equal to the one for Republican Legislature can be rejected at the 1%-level for the specifications shown in columns (2) and (3). The IV-estimations thus confirm that the effect of partisan politics on state tax policy – measured either by the state tax burden or by income stabilization – is substantial. We confirm Reed's finding that the coefficient on income becomes insignificant in the model with state tax burden as dependent variable (column (2)) and increases in size in the regression on income stabilization (column (3)). This points to the fact that the coefficient on income is indeed negatively biased in the OLS estimation.

Choice of time interval. One obvious concern is how sensitive the results are with respect to the choice of the time interval. In order to address this question, we collapse our thirty-year sample into shorter intervals ranging from yearly data to 4-year periods. This increases the number of observations from 270 in our baseline (Table 5.7.4, column (2) and (3)) up to 1350 when yearly data are considered. Estimation results for both dependent variables are reported in Table 5.7.7.[20] As before, all right-hand side variables are lagged by one period.

How do results compare with our baseline estimates?[21] Across specifications we find either the negative coefficient on Republican Legislature, the positive coefficient on Democratic Legislature or both coefficients to be significant. Importantly, this does not change our main conclusion from the previous analyis. The null hypothesis that the coefficient for Democratic Legislature is equal to the one for Republican Legislature can be rejected irrespective of the choice of the time interval. We find largest effects for the specification based on yearly data. In this case both state tax burden and income stabilization are estimated to increase by 5% relative to their mean value after a switch from Republican to Democratic control of the state legislature.

[20] Apart from the time interval, the alternative specifications are identical to those reported in Table 5.7.4. For the sake of brevity, in Table 5.7.7 we only show coefficients for the political party variables.

[21] Note that coefficients need to be adjusted such that they reflect the same time interval, i.e. coefficients from the specification with yearly data need to be multiplied by 5, those from the specification with 2-year intervals by 2.5 and so on.

5.5.2 Inequality

Compared with the analysis presented in the previous section, we make three extensions in order to analyze the partisan effect of tax policy on inequality in more detail. First, we address the impact of federal tax legislation. The tax policy effect differs from the state tax burden insofar as it is influenced by both federal and state level policies while the state tax burden is solely determined at the state level. To account for tax legislation on the federal level, we include a dummy variable which takes a value of 1 if there was a Democratic President in a given year.[22] Second, we use additional information in our data indicating if more than a 50% majority is needed in a state legislature to pass a tax increase. In some states, either 60%, 67%, or 75% of the seats are needed in both chambers of the legislature to be able to pass a tax increase.[23] We are thus able to exploit a more narrow measure of control of the state legislature.[24] Third, in addition to the legislative branch we account for the executive branch of the state government in order to get a more complete picture of the partisan impact on tax policy.

Instead of collapsing the data into 5-year time intervals we use yearly data as the preferred specification. The reason for this choice is that the policy effect is measured in annual changes rather than levels.[25] All other control variables, again lagged by one period, correspond to those from the previous analysis. We run regressions with the tax policy effect on different inequality measures (P90/P10, P90/P50, P50/P10, Gini) as dependent variable. This enables us to estimate the partisan effect on different parts of the income distribution. Compared with

[22] The inclusion of this additional covariate comes at the cost that we can only control for three period fixed effects corresponding to the three decades our sample spans, but not for fixed effects for each time point. The reason is that both time controls do no vary across states but only over time.

[23] The share of Democratic control of both chambers of a state legislature is 51% according to the standard measure (cf. Table 5.7.3), but only 46% with the more narrow party control variable which accounts for the required majority in both chambers to pass a tax increase. The shares of Republican control are 27% and 24%, respectively.

[24] Note that with the more narrow measure of party control of the state legislature accounting for the required majority to pass a tax increase, the residual category regarding the state legislature is composed of split control and a partisan majority in both chambers which is not sufficient to pass a tax increase.

[25] As in the previous section, we have experimented with different time intervals and do not find substantial differences across specifications.

previous studies which usually use total inequality as dependent variable, we are able to exploit a measure which is under direct control of the government and which is solely affected by changes in tax legislation.[26] The empirical analysis shall cast light on the question to what extent the policy effect is determined by Democratic and Republican control of the legislative and executive branch of the state government as well as by differences in partisan tax policy on the federal level. Results are reported in Table 5.7.8.

Focus first on the upper panel of Table 5.7.8 showing regression results with political party controls for the state legislature and the federal administration. The first important result is that the coefficient for Democratic President is negative and highly significant irrespective of the inequality measure under consideration. For example, the coefficient on Democratic President in column (1) implies that in our sample period federal tax policy by Democratic administrations leads to an average yearly reduction of the policy effect on the P90/P10 ratio of 0.065 percentage points. This estimate should be compared with an average yearly *increase* in this percentile ratio of 0.059 or, alternatively, against an average policy effect of -0.004 which shows that the effect is also economically large. The partisan effect gets larger when we additionally account for party control of the legislature. We find highly significant coefficients for Democratic Legislature when the policy effect on the P90/P10, P50/P10 and on the Gini is the dependent variable. In these specifications we can reject the hypothesis that the coefficients for Democratic and Republican Legislatures are equal at the 1% level. For example, the coefficient on Democratic Legislature in the first column of the upper panel in Table 5.7.8 implies that on average a Democratic Legislature leads to a reduction of the policy effect on the P90/P10 ratio of 0.019 percentage points per year. This is almost 5 times as large as the average policy effect.

Turning next to the lower panel of Table 5.7.8, we find an additional effect of the executive branch of the state government on the policy effect holding constant party control of the state legislature. The coefficient on Democratic Governor is

[26] Recall that our decomposition analysis introduced in chapter 4 enables us to decompose the total change in inequality into a component which is the direct consequence of policy changes ('policy effect') and a residual term which captures changes in the pre-tax income distribution ('other effect'). In particular, potential migration responses to state income taxes are captured by the other effect and do not affect the policy effect.

highly significant in three out of four specifications, but somewhat smaller than the coefficient on Democratic Legislature. Compared with the upper panel, coefficients on Democratic and Republican Legislature and on Democratic President do not change much indicating that party control of the executive branch indeed matters for the redistributive effect of state tax policy.[27] Our estimates imply that the policy effect on the P90/P10 ratio is reduced by 0.032 percentage points if Democrats control both branches of the state government. Relative to its mean value, a 5-year Democratic control of the state government would lead to a reduction in post-tax inequality measured by the P90/P10 ratio of approximately 3%. Adding the effect of a Democratic administration on the federal level to this, the P90/P10 ratio would be reduced by 9% with policy changes affecting the lower and the upper half of the distribution contributing each roughly the same share.[28]

Importantly, these numbers disregard any behavioral responses to changes in tax legislation which are captured by the other effect in our decomposition analysis. Taking into account that a change in tax policy induces behavioral responses and that these indirect effects also impact on the income distribution, one can argue that the partisan effect would be larger or smaller depending on the empirical question if these so-called 'second round' effects work in the same direction as the direct policy effect or not. Consider the introduction and subsequent expansions of the Earned Income Tax Credit (EITC) as an illustration of this argument. Our decomposition analysis in chapter 4 has shown that in years with substantial expansions of the EITC the direct policy effect was to reduce inequality, in particular in the lower half of the distribution. Besides these direct effects, the behavioral reactions such as an increase in participation rates among married couples and single mothers can be expected to have had a further dampening effect on inequality. Hence, the total partisan effect which additionally accounts for indirect effects would be even larger.

[27] This finding appears to be in contrast with Reed (2006) who does not find a gubernatorial effect on the state tax burden.

[28] The P90/P50 ratio as well as the Gini would be reduced by 4% and the P50/P10 ratio by 5% if both the federal administration and the state government were controlled by Democrats.

5.6 Conclusions

In this paper we have examined the relationship between redistribution and the political cycle in the US for the period 1978-2008. The fiscal federalism landscape in the US is characterized by the fact that redistribution through the income tax system occurs both on the federal as well as the state level. This institutional framework has enabled us to estimate regressions for a panel of US states with different measures of redistribution on the left-hand side and political party variables on the right-hand side of the regression equation. In line with the literature on partisan politics and economic outcomes, we have addressed the issue of endogeneity of political parties by including a large set of voter and state characteristic variables in our analysis in order to minimize any bias which might result from unmeasured voter preferences. We have investigated the impact of partisan politics on the state tax burden, on income stabilization in case of proportional shocks to gross income and on the policy effect on inequality. These are distinct measures for the redistributiveness of the income tax system. State tax burden can be considered as an indicator for tax levels, income stabilization serves as a proxy for income insurance, while the policy effect isolates the component of the change in inequality which directly results from changes in tax legislation.

We find strong evidence for the hypothesis that tax legislation enacted by Republican and Democratic governments significantly differs in terms of its redistributive effect. Our estimations show that the state tax burden (income stabilization) increases by 3-5% (2-5%) after a switch from Republican to Democratic control of the state legislature. In the analysis on the partisan effects on inequality, we have argued that a key advantage of our approach compared with previous studies is that our left-hand side variable isolates the pure policy effect on inequality from other changes in the pre-tax income distribution which are beyond the control of the government such as migration responses after changes in state income taxes. We are thus able to investigate the 'intended' impact of tax policy on the income distribution. Our results suggest that party control of both the legislative and the executive branch of state government has a significant effect on changes in inequality. Joint control of both branches of the state government by Democrats leads to a reduction in post-tax inequality of up to 3% relative to

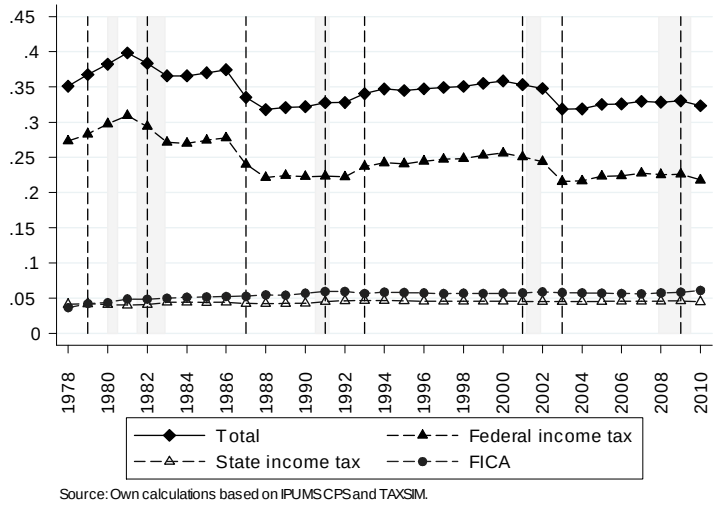
Republican control. When we additionally consider the effect of federal tax legislation, the effect of Democratic control increases further and ranges, depending on the inequality measure, between 4-9%.

The analysis of partisan effects on inequality could be extended in several directions. Firstly, it would be possible to incorporate other state-administered, redistributive instruments besides income taxes in the existing framework, for example sales taxes and cash benefits such as AFDC/TANF and unemployment benefits. Clearly, the inclusion of these policies would give a broader picture with regard to state level redistribution. However, we believe that our more narrow approach focusing on the income tax system already gives valuable insights into the political economy of redistribution in the US and the important impact partisan politics can have on the income distribution. Secondly, our decomposition analysis allows us to explore possible interactions between the policy effect and changes in pretax inequality. In this regard, it would be interesting to investigate politicians' reaction functions and whether these have changed over time. Thirdly, one could decompose the policy effect by disentangling the influence federal and state level policies have on income inequality. We intend to pursue these issues in future research.

5.7 Appendix:

5.7.1 Results

Figure 5.7.1: Income stabilization coefficient, 1978-2010



Note: The dashed vertical lines indicate the start of implementation of significant changes in tax legislation (section 3.4). Shaded areas show recession periods (NBER classification).

Table 5.7.1: Income stabilization by component and state, 1978-2010

	Total				Federal income tax				State income tax				FICA			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
Alabama	32.64	1.81	29.70	36.97	23.25	2.35	19.90	28.37	3.56	0.19	3.15	3.83	5.83	0.58	3.86	6.57
Alaska	32.39	4.15	27.52	43.39	26.94	4.62	21.29	37.26	0.21	1.23	0.00	7.05	5.24	1.04	2.17	6.35
Arizona	34.34	2.77	30.68	40.70	24.57	2.77	21.42	30.84	4.41	0.77	3.43	5.79	5.37	0.59	3.51	6.07
Arkansas	33.07	1.51	30.14	36.02	21.91	2.29	19.39	26.89	5.18	0.88	3.37	6.28	5.98	0.61	4.34	6.81
California	37.47	2.28	34.25	43.36	25.50	2.97	22.14	32.52	6.83	0.54	5.51	7.50	5.14	0.55	3.34	5.78
Colorado	35.66	2.67	32.46	41.80	25.67	3.17	22.09	33.31	4.71	0.33	3.80	5.32	5.28	0.62	3.24	5.91
Connecticut	34.78	2.42	28.52	37.77	26.59	2.76	23.14	32.09	3.14	2.44	0.09	5.44	5.05	0.49	3.74	5.85
Delaware	36.49	3.05	32.37	44.33	24.17	2.72	20.75	31.11	6.63	1.13	5.26	8.68	5.69	0.70	3.71	6.60
DC	39.95	2.53	36.05	45.97	26.31	2.68	22.26	33.09	8.86	0.51	7.97	9.77	4.77	0.43	3.31	5.40
Florida	29.69	2.03	26.72	35.11	24.27	2.39	21.12	30.50	0.00	0.00	0.00	0.00	5.42	0.55	3.87	6.17
Georgia	35.45	2.09	32.58	40.71	24.22	2.63	20.65	30.50	5.59	0.17	4.97	5.77	5.64	0.63	3.89	6.43
Hawaii	38.15	2.70	34.31	44.73	24.22	2.57	20.98	30.68	8.30	0.70	7.13	9.05	5.63	0.52	3.75	6.41
Idaho	35.32	1.91	32.39	39.98	22.50	2.39	19.30	27.93	7.05	0.29	6.38	7.56	5.77	0.57	3.73	6.46
Illinois	33.52	2.34	30.48	39.45	25.29	2.85	21.79	32.21	2.84	0.22	2.47	3.03	5.39	0.59	3.37	6.08
Indiana	32.32	1.67	29.93	35.58	23.32	2.39	20.26	28.39	3.12	0.55	1.70	3.49	5.88	0.58	3.94	6.68
Iowa	34.36	2.09	31.72	40.24	23.02	2.90	19.63	30.79	5.61	0.45	4.54	6.14	5.74	0.66	3.92	6.60
Kansas	34.81	1.99	30.58	38.39	23.86	2.60	20.40	29.25	5.32	0.91	3.45	6.40	5.62	0.56	3.99	6.47
Kentucky	34.30	1.77	31.22	38.31	23.20	2.46	19.71	29.23	5.27	0.81	3.97	5.98	5.83	0.60	3.98	6.67
Louisiana	32.66	2.07	29.96	37.73	24.02	3.09	19.53	31.17	3.03	0.73	1.60	4.20	5.61	0.67	3.77	6.45
Maine	35.29	1.39	32.87	37.83	22.34	1.95	19.10	26.41	7.09	0.80	4.71	7.97	5.87	0.49	4.16	6.54
Maryland	36.64	2.80	33.39	43.29	26.57	3.33	22.82	34.07	4.88	0.11	4.63	5.11	5.19	0.67	3.23	6.26
Massachusetts	36.48	1.88	33.48	40.72	25.79	2.15	23.11	30.52	5.48	0.39	4.97	6.28	5.21	0.43	3.89	5.79
Michigan	35.16	2.62	31.64	40.92	24.80	2.86	21.42	31.24	4.85	0.51	4.25	6.51	5.52	0.62	3.34	6.12
Minnesota	37.65	2.65	34.51	43.13	24.13	2.30	21.21	29.21	7.98	0.94	6.78	10.67	5.54	0.55	3.73	6.11
Mississippi	32.39	1.72	29.52	37.02	22.45	2.40	19.10	29.20	4.01	0.71	2.13	4.76	5.93	0.61	4.26	6.71

Source: Own calculations based on TAXSIM.

Table 5.7.2: Income stabilization by component and state, 1978-2010 (cont.)

	Total				Federal income tax				State income tax				FICA			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
Missouri	34.03	1.81	31.42	39.04	23.81	2.60	20.56	30.96	4.54	0.79	3.07	5.45	5.68	0.61	3.79	6.39
Montana	34.30	2.30	30.53	40.53	22.26	3.11	17.86	30.17	6.12	0.33	5.49	6.89	5.92	0.69	3.98	6.60
Nebraska	33.97	1.99	30.16	39.02	22.92	2.49	20.18	29.56	5.30	0.78	3.84	6.35	5.75	0.59	3.91	6.36
Nevada	30.29	2.58	27.11	36.98	24.59	2.99	20.90	31.96	0.00	0.00	0.00	0.00	5.71	0.58	3.79	6.28
New Hampshire	30.56	2.02	27.80	36.45	24.96	2.28	21.92	31.55	0.08	0.04	0.03	0.18	5.52	0.51	4.04	6.19
New Jersey	35.24	1.71	31.90	39.13	26.47	2.43	23.62	32.17	3.74	1.03	2.20	5.24	5.02	0.47	3.34	5.59
New Mexico	34.17	1.89	31.19	39.53	23.43	2.94	20.07	31.45	5.12	0.98	3.01	6.28	5.61	0.65	3.81	6.48
New York	37.75	2.71	34.56	43.93	24.89	2.26	22.00	30.15	7.59	1.01	6.47	9.54	5.26	0.49	3.61	6.09
North Carolina	35.66	1.69	33.16	39.27	23.18	2.20	20.59	28.20	6.69	0.42	5.80	7.34	5.79	0.47	4.35	6.32
North Dakota	31.29	2.33	27.61	37.51	22.67	3.03	18.23	31.07	2.86	0.30	1.94	3.45	5.76	0.70	3.91	6.52
Ohio	34.26	2.06	31.35	38.19	24.10	2.88	20.15	30.62	4.49	0.86	2.27	5.36	5.67	0.64	3.67	6.52
Oklahoma	35.16	2.15	32.00	40.15	23.82	2.98	19.66	30.70	5.71	0.73	4.22	6.53	5.63	0.64	3.74	6.49
Oregon	37.23	2.32	33.81	42.39	23.42	2.67	19.83	29.67	8.22	0.52	6.67	8.82	5.59	0.55	3.72	6.31
Pennsylvania	32.66	1.90	29.71	36.96	24.42	2.31	21.54	29.58	2.69	0.38	2.13	3.19	5.55	0.49	3.87	6.24
Rhode Island	35.61	1.80	32.27	38.22	24.02	1.77	21.63	27.32	5.95	0.61	4.90	6.96	5.64	0.40	4.16	6.27
South Carolina	35.02	1.90	31.69	38.55	22.82	2.24	19.36	26.73	6.27	0.11	6.04	6.47	5.94	0.58	3.91	6.65
South Dakota	28.06	1.83	25.55	32.91	22.24	2.19	19.33	27.60	0.00	0.00	0.00	0.00	5.82	0.59	4.05	6.49
Tennessee	29.22	2.09	26.34	33.73	23.36	2.48	19.76	28.40	0.09	0.04	0.03	0.21	5.76	0.57	3.94	6.65
Texas	30.48	2.79	27.11	37.90	25.05	3.27	21.33	33.37	0.00	0.00	0.00	0.00	5.43	0.63	3.61	6.22
Utah	34.79	1.80	32.50	39.13	23.15	2.59	19.99	29.36	5.87	0.51	4.89	7.47	5.76	0.62	3.92	6.65
Vermont	34.67	1.87	31.59	38.87	22.87	2.03	20.15	27.43	6.01	0.44	4.74	6.88	5.79	0.56	4.07	6.71
Virginia	36.32	2.23	32.71	41.64	25.65	2.72	21.60	31.78	5.39	0.23	4.77	5.75	5.28	0.52	3.51	5.93
Washington	30.77	2.35	27.84	36.43	25.36	2.77	21.82	31.58	0.00	0.00	0.00	0.00	5.41	0.59	3.42	6.03
West Virginia	33.30	1.83	30.61	37.02	22.07	2.19	19.39	26.53	5.15	0.77	3.43	6.51	6.08	0.58	4.43	6.84
Wisconsin	36.62	2.42	33.44	42.55	23.48	2.61	20.35	29.85	7.42	0.43	6.94	8.54	5.72	0.61	3.80	6.36
Wyoming	29.57	2.83	25.87	37.95	23.75	3.44	19.75	33.21	0.00	0.00	0.00	0.00	5.82	0.78	3.47	6.80

Source: Own calculations based on TAXSIM.

Table 5.7.3: Descriptive statistics, 1978-2008

	Mean	Standard Deviation	Minimum	Maximum
Tax Burden	10.46	1.29	7.16	13.71
Income Stabilization	33.21	2.86	25.94	40.28
Policy effect on P90/P10 ratio	-0.004	0.069	-0.45	0.32
Policy effect on P90/P50 ratio	0.0009	0.013	-0.05	0.08
Policy effect on P50/P10 ratio	-0.003	0.026	-0.018	0.08
Policy effect on Gini	0.01	0.22	-0.62	0.72
Initial Tax Burden	10.54	1.35	7.16	14.90
Democratic Legislature	50.81	46.16	0.00	100.00
Republican Legislature	26.67	39.85	0.00	100.00
Democratic Governor	51.41	42.42	0.00	100.00
Democratic President	36.67	48.21	0.00	100.00
ADA Average	42.40	20.52	3.39	85.82
Log of Real PCPI	3.18	0.21	2.73	3.89
Percent Elderly	11.92	1.71	7.63	17.12
Percent Black	11.94	12.66	0.10	71.02
Percent Female	51.24	0.82	48.74	53.81
Percent College-Educated	11.81	6.63	2.15	36.72
Percent Union	14.67	6.70	3.04	34.44
Population Density	381.15	1360.30	5.43	10061.45
Farm Share	1.21	1.48	-0.03	7.93
Manufacturing Share	13.71	6.13	0.64	32.05

Table 5.7.4: OLS estimation

(1) Results from Reed (2006), 1960-2000. (2) and (3) Own calculations, 1978-2008			
	(1)	(2)	(3)
Dependent variable	Tax Burden	Tax Burden	Inc. Stab.
Democratic Legislature	0.33**	0.2347**	0.5139***
	(2.58)	(2.206)	(2.953)
Republican Legislature	0.02	-0.0598	-0.0805
	(0.13)	(-0.526)	(-0.398)
ADA score	-0.0021	0.001429	-0.001679
	(-0.71)	(0.399)	(-0.270)
Log of Real PCPI	-1.7189**	-1.962718**	7.648536***
	(-2.12)	(-2.405)	(5.265)
Percent Elderly	-0.0815	-0.033183	-0.056201
	(-1.60)	(-0.861)	(-0.876)
Percent Black	-0.0766**	-0.037468*	-0.093812**
	(-2.42)	(-1.712)	(-2.282)
Percent Female	0.0263	0.084143	-0.050752
	(1.42)	(1.317)	(-0.506)
Percent College-Educated	-0.0489**	-0.006702	0.008033
	(-2.22)	(-0.262)	(0.149)
Percent Union	0.0174	0.000022	0.041606
	(1.10)	(0.000926)	(1.073)
Population Density	0.0075***	0.004841**	-0.002168
	(4.15)	(2.486)	(-0.571)
Farm Share	-0.0718	0.071737	-0.141870
	(0.879)	(0.884)	(-0.923)
Manufacturing Share	-0.0915***	0.007662	0.017524
	(-4.25)	(0.436)	(0.575)
Initial Tax Burden	0.4368***	0.185496***	0.365933***
	(8.28)	(2.970)	(3.012)
Observations	360	270	270
Adjusted R-squared	0.825	0.908	0.940
Pol. Party Hypothesis Test (p-value)*	0.029	0.009	0.007
Robust t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1			

Notes: (1) is taken from Reed (2006), Table 2, Eq. C. Dependent variable is the state tax burden for the period 1960-2000. Equations (2) and (3) are estimated for the period 1978-2008. (2) shows results for the same model as in (1), but with the more recent sample period. Dependent variable in equation (3) is the overall income stabilization coefficient measured on the state level. All specifications include state and time fixed effects. With regard to the political party controls, the residual category is split control of the state legislature. *The null hypothesis is that the coefficient for Democratic Legislature is equal to the one for Republican Legislature.

Table 5.7.5: Summary statistics from first-stage regression

Dependent variable	Partial R2	F(9,207)
Log of Real PCPI	0.7169	53.01
Percent Elderly	0.3874	12.13
Percent Black	0.5184	10.13
Percent Female	0.3071	7.69
Percent College-Ed.	0.7229	50.90
Percent Union	0.6223	30.24
Pop. Density	0.9058	184.12
Farm Share	0.1667	1.95
Manufact. Share	0.9486	344.68

Notes: First-stage F-statistic is heteroskedasticity-robust.

Table 5.7.6: 2SLS estimation

(1) Results from Reed (2006), 1960-2000. (2) and (3) Own calculations, 1978-2008			
	(1)	(2)	(3)
Dependent variable	Tax Burden	Tax Burden	Inc. Stab.
Democratic Legislature	0.32**	0.2241**	0.5015***
	(2.41)	(2.390)	(3.293)
Republican Legislature	-0.06	-0.0610	-0.0819
	(-0.4)	(-0.622)	(-0.461)
ADA score	-0.0012	0.001718	-0.001342
	(-0.39)	(0.533)	(-0.245)
Log of Real PCPI	0.7806	-0.252749	9.645108***
	(0.78)	(-0.295)	(6.261)
Percent Elderly	0.0887	-0.041407	-0.065805
	(-1.57)	(-1.185)	(-1.154)
Percent Black	-0.0689*	-0.041203**	-0.098173***
	(-1.82)	(-2.043)	(-2.642)
Percent Female	0.02335	0.090694	-0.043103
	(0.82)	(1.593)	(-0.485)
Percent College-Educated	-0.0546**	-0.017882	-0.005021
	(-2.09)	(-0.794)	(-0.111)
Percent Union	-0.0219	-0.005946	0.034639
	(-1.02)	(-0.284)	(1.019)
Population Density	0.0084***	0.005107***	-0.001858
	(4.49)	(2.967)	(-0.551)
Farm Share	-0.0465*	0.085577	-0.125709
	(-1.86)	(1.211)	(-0.926)
Manufacturing Share	-0.0592**	0.012356	0.023005
	(-2.40)	(0.765)	(0.868)
Initial Tax Burden	0.4687***	0.200358***	0.383286***
	(8.52)	(3.591)	(3.507)
Observations	360	270	270
Adjusted R-squared	n.a.	0.906	0.940
Pol. Party Hypothesis Test (p-value)*	0.012	0.0035	0.0022
Robust z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1			

Notes: (1) is taken from Reed (2006), Table 3, Eq. C. Dependent variable is the state tax burden for the period 1960-2000. Equations (2) and (3) are estimated for the period 1978-2008. (2) shows results for the same model as in (1), but with the more recent sample period. Dependent variable in equation (3) is the overall income stabilization coefficient measured on the state level. In all specifications, the 5-year average of real per capita income is instrumented by its initial value at the beginning of the 5-year period. All specifications include state and time fixed effects. With regard to the political party controls, the residual category is split control of the state legislature. *The null hypothesis is that the coefficient for Democratic Legislature is equal to the one for Republican Legislature.

Table 5.7.7: Choice of time interval

	Tax Burden	Inc. Stab.	Tax Burden	Inc. Stab.
	4-year intervals		3-year intervals	
Democratic Legisl.	0.13	0.46**	0.13*	0.30*
	(1.055)	(2.146)	(1.660)	(1.904)
Republican Legisl.	-0.27**	-0.02	-0.12*	-0.14
	(-2.379)	(-0.0989)	(-1.665)	(-0.846)
Observations	315	315	450	450
Adjusted R^2	0.896	0.934	0.905	0.940
Pol. Party Hyp. Test (p-value)*	0.0015	0.0475	0.0021	0.0140
	Tax Burden	Inc. Stab.	Tax Burden	Inc. Stab.
	2-year intervals		Yearly data	
Democratic Legisl.	0.08	0.26**	0.04	0.16**
	(1.374)	(2.053)	(1.477)	(2.080)
Republican Legisl.	-0.13**	-0.24*	-0.06**	-0.14*
	(-2.496)	(-1.826)	(-2.050)	(-1.930)
Observations	675	675	1350	1350
Adjusted R^2	0.914	0.938	0.945	0.945
Pol. Party Hyp. Test (p-value)*	0.0003	0.0013	0.0023	0.0007
Robust t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1				

All specifications include the same set of state characteristic control variables as well as time and state fixed effects as in our baseline. *The null hypothesis is that the coefficient for Democratic Legislature is equal to the one for Republican Legislature.

Table 5.7.8: Partisan effect on inequality

	(1) P90/P10	(2) P90/P50	(3) P50/P10	(4) Gini
Democratic Legislature	-0.0192***	-0.0015*	-0.0075***	-0.0394***
	(-3.630)	(-1.660)	(-3.170)	(-2.704)
Republican Legislature	0.0044	-0.000052	0.0028	0.0241
	(0.878)	(-0.0562)	(1.233)	(1.561)
Democratic President	-0.0651***	-0.0154***	-0.0124***	-0.2256***
	(-11.68)	(-14.45)	(-5.976)	(-12.20)
Observations	1350	1350	1350	1350
Adjusted R^2	0.264	0.286	0.140	0.368
Pol. Party Hyp. Test (p-value)*	0.0001	0.1917	0.0001	0.0005
	(1) P90/P10	(2) P90/P50	(3) P50/P10	(4) Gini
Democratic Legislature	-0.0197***	-0.0015*	-0.0077***	-0.0405***
	(-3.723)	(-1.681)	(-3.264)	(-2.787)
Republican Legislature	0.0021	-0.0002	0.0018	0.0181
	(0.414)	(-0.173)	(0.793)	(1.170)
Democratic Governor	-0.0126***	-0.0006	-0.0052***	-0.0327***
	(-3.575)	(-0.873)	(-3.605)	(-3.085)
Democratic President	-0.0643***	-0.0154***	-0.012***	-0.2234***
	(-11.60)	(-14.42)	(-5.834)	(-12.18)
Observations	1350	1350	1350	1350
Adjusted R^2	0.270	0.285	0.148	0.372
Pol. Party Hyp. Test (p-value)*	0.0002	0.2217	0.0003	0.0013
Robust t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1				

The dependent variable is the tax policy effect on a given inequality measure, i.e. the component of the yearly change in inequality which is due to changes in tax policy. All equations are estimated for the period 1978-2008 and include state characteristic control variables as well as state and period fixed effects. *The null hypothesis is that the coefficient for Democratic Legislature is equal to the one for Republican Legislature.

5.7.2 Data appendix

State political variables. State political variables are from Klarner (2003), as well as updates available on the State Politics and Policy Web Site.

(http://academic.udayton.edu/SPPQ-TPR/klarner_datapage.html, accessed at December 15th, 2011). ADA Average is from Anderson and Habel (2009) who update the data initially compiled by Groseclose, Levitt and Snyder (1999).

State economic variables. Data on state Tax Burden is provided by the Tax Foundation (http://www.taxfoundation.org/taxdata/show/336.html, accessed at December 10th, 2011). Income stabilization coefficients and the series on direct policy effects result from own calculations based on IPUMS CPS and NBER's TAXSIM model. Data on state Personal Income, Farm and Manufacturing Share is provided by the Bureau of Economic Analysis.

Other state characteristic variables. State characteristics such as percent elderly, percent black, percent female and percent college-educated are based on information contained in IPUMS CPS. Data on union density is from Hirsch et al. (2001), with updates available on http://unionstats.gsu.edu/MonthlyLaborReviewArticle.htm (accessed at December 15th, 2011). Population density is provided by the Census Bureau.

Chapter 6

Concluding remarks

The aim of this book was to evaluate the stabilizing and redistributive role of tax and transfer systems in Europe and the US. In the first chapter, we briefly introduced the method of counterfactual simulations which is applied throughout this book. Chapter 2 compared the effectiveness of automatic stabilizers in Europe and the US to protect households against income losses and to stabilize aggregate demand. Chapter 3 extended this analysis and asked how much weight European tax and transfer systems put on different income groups to insure them against income shocks. Chapter 4 shifted the focus to the redistributive role of the income tax system in the US during the last three decades and analyzed the direct effects of tax policy reforms on the income distribution. In chapter 5, we first documented how the strength of automatic stabilizers has changed over time in the US. We then estimated in a set of panel regressions for the US states partisan effects on the stabilizing and redistributive capacity of the income tax system.

Our main results and the resulting policy implications can be summarized as follows:

"How large is the EU-US stabilization gap?"

In case of a proportional income shock, the difference in automatic stabilization between Europe and the US is not as large as the widely held opinion might suggest. In particular, especially in Eastern and Southern European countries automatic stabilizers are below the US level. Comparing income stabilization stemming from the income tax only and accounting for state income taxes in the US, we find

that the US value is even above the European average. When we consider an asymmetric unemployment shock, however, the picture changes completey and the EU-US stabilization gap increases substantially. Social transfers account for a large part of the rise in the stabilization gap.

Our analysis has shown that simple macro indicators for automatic stabilization such as revenue or expenditure to GDP ratios or semi-elasticities used by the OECD can be useful predictors for stabilization of disposable income, but can be misleading indicators for stabilization of aggregate demand. The reason is that the latter depends on the prevalence of liquidity constraints. This suggests that in economic downturns, policy measures aiming at low income housholds which have a higher probability to be liquidity constrained and thus a higher propensity to consume should yield higher stabilizing effects than general tax cuts. Our analysis has abstracted from normative welfare considerations about the optimal size of automatic stabilization. Increasing the size of automatic stabilizers might have negative side-effects in terms of efficiency. A potential way to minimize these costs, however, is to implement discretionary policies that are triggered if certain economic thresholds are passed.[1] A comparison between the size of automatic stabilizers and discretionary fiscal policy measures passed during the crisis reveals that the US compensated weaker automatic stabilizers by a larger fiscal stimulus, whereas European governments relied more heavily on the workings of automatic stabilizers. The answer to the question which of these approaches proves to be more effective to provide macroeconomic stability depends on a number of factors, including how timely and well targeted discretionary policy measures are as well as on the credibility of subsequent consolidation plans.[2] With regard to the latter point, in an economic upswing automatic stabilizers lead to increased tax revenue and lower spending on unemployment benefits without any policy intervention, whereas delayed exit strategies from discretionary measures may lead to pro-cyclical fiscal policy and unsustainable debt accumulation.

"How do European tax and transfer systems protect households at different income levels against losses in current income?"

[1] For example, the Extended Benefit program in the US kicks in automatically in states that meet certain thresholds with regard to the unemplyoment rate. See Baunsgaard and Symansky (2009) for a discussion on automating the discretionary fiscal response.

[2] Cf. Debrun and Kapoor (2010).

Our findings indicate that there is very little stabilization of disposable income for low-income households in some Eastern and Southern European countries. Given that the marginal benefit of an increase in income stabilization is highest for these households from an insurance point of view, our results suggest that there is some scope for enhancing automatic stabilizers in these countries.

"To what extent have changes in US tax policy counteracted or accelerated the rise in income inequality?"

While the redistributive role of the US income tax system has increased over time due to a dramatic increase in pre-tax income inequality, our decomposition analysis has shown that policy effects almost cancel out over the whole time period. Note that our data do not allow us to draw any conclusions with regard to the top of the income distribution due to topcoding of high incomes in the CPS. This is insofar a limitation as the rise in inequality was to a large extent driven by increases in top income shares. Irrespective of this limitation, our results suggest that inequality also rose at other parts of the distribution and legislative changes in tax policy counteracted these trends in some periods, but accelarated the increase in inequality in other periods. Similiar to the analysis in chapters 2 and 3, we have abstained from making normative statements with regard to the optimal level of redistribution or inequality. Defining an acceptable level of inequality is ultimately a challenge the society as a whole needs to decide upon. Our analysis has rather aimed at identifying the policy impact on inequality in an unbiased manner.

"Are there significant differences in the stabilizing and redistributive role of the US income tax system under Democratic and Republican administrations?"

The simple answer to this question is: Yes. More precisely, we show that automatic stabilizers increase by 2-5% after a switch from Republican to Democratic control of the state government. Considering party control of both the state legislative and executive branch as well as the impact of policy changes enacted on the federal level, we find that Democratic control leads to a reduction in post-tax inequality of 4-9% depending on the inequality measure. In light of the contrasting proposals of the Democratic and Republican party to reform the federal income tax system after the federal election in November 2012, our analysis on past tax policy changes indicates that the implementation of these proposals would have large, but strongly opposing effects on income inequality.

Summing up the main lessons of this book, one can conclude that tax policy indeed matters for inequality and stabilization. Future research should account for indirect policy effects through behavioural adjustments and their impact on redistribution and stabilization. Labor supply responses could provide significant supply-side automatic stabilization. Changes in progressive taxation can be suspected to affect rent-seeking activities of top earners which might have contributed to the surge in top incomes in the last decades. These are only two examples of potentially important indirect policy effects. Credible empirical identification of these effects would contribute to advance our knowledge on overall policy effects.

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09/2009-09/2011	Institute for the Study of Labor (IZA), Research Affiliate
10/2007-09/2008	Finanzwissenschaftliches Forschungsinstitut (FiFo Köln)
	Student Research Assistant
08/2007-09/2007	German Ministry of Finance
	Intern in the Dep. "European and International Economic Policy"
01/2007-03/2007	WestLB AG, Intern
02/2005-04/2004	Institut der deutschen Wirtschaft, Intern
09/2000-03/2003	Sparkasse Herford, Apprentice
08/1999-07/2000	Lebenshilfe Herford, Civilian Service

Education

10/2008-09/2011	Cologne Graduate School in Management, Economics
	and Social Sciences, Doctoral Fellow
	Ph.D. Thesis Committee: Prof. Dr. C. Fuest, Prof. Dr. F. Bierbrauer
04/2003-09/2008	University of Cologne, Department of Economics
	Diploma in Economics (equiv. M.A. Economics)
08/2006-12/2006	Stockholm School of Economics
	Undergraduate Studies in Economics