Part III

Impact of fiscal policy on income distribution

Please cite this as follows:

European Commission (2017), Impact of fiscal policy on income distribution, Report on Public Finances in EMU 2017, 71-131.

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KEY FINDINGS

This part analyses the role of fiscal policy on inequality of *incomes*, leaving aside the equally-important dimension of inequality of opportunities or wealth. As a novelty, the analysis not only captures the *direct impact* of the tax and benefit system on disposable income. It also tries to assess the *total effect* of fiscal policy on inequality by taking into account behavioural and macroeconomic feedback effects, which can reinforce or offset the direct effect. Overall, the chapter makes clear that fiscal policy needs to be carefully designed to balance equity, stabilisation and efficiency considerations, taking into account potentially harmful indirect effects.

Fiscal policy has mitigated the increase in income inequality coming from market forces

- While income inequality in the EU on average was in 2014 higher than in 1980, its increase mainly results from a level shift of inequality in the 1990s. Since 2000, inequality of market/gross income (i.e. before taxes and transfers) further increased to reach the same levels as the US in 2014, whereas inequality of disposable/net income (i.e. after taxes and transfers) has remained broadly unchanged and clearly below the levels of other advanced economies.

- Government redistribution via the tax and benefit system had a *direct effect* in reducing income inequality in the EU by almost one-third. The size of government redistribution has increased significantly in recent decades and was in 2014 almost twice as great as in the US. Income redistribution appears to run from high- to low- and middle-income households, reflecting the progressivity of the tax and benefit system.

- Panel data analysis reveals that the *total effect* of fiscal policy on inequality reduction is smaller than its direct effect, mostly due to the behavioural responses and macroeconomic effects. Our findings show that only some expenditure items, in particular education and health spending, as well as sickness, disability, family and child benefits, significantly reduced income inequality in the EU on average over the period 1980 to 2014.

Fiscal policy is also important in stabilising income and consumption across income deciles over the economic cycle

- The tax and benefit system provides a mechanism which automatically, i.e. at unchanged policies, smooths income and consumption over the economic cycle. During downturns, government revenue decreases while public spending stays the same or slightly increases. During booms, government revenues increase while public spending stays the same or slightly decreases.

- The degree of *direct* automatic stabilisation is fairly high in the EU in 2014 according to new simulations based on EUROMOD. Around 33% of disposable income is absorbed in the EU on average by the tax and benefit system following a shock to market income, ranging from 20% in Bulgaria to 45% in Austria. Consumption is absorbed by even 70% in the EU on average due to the tax and benefit system and the saving behaviour, ranging from 64% in Bulgaria to 75% in Ireland. The more progressive the tax and benefits system, the higher its stabilisation effect.

- The *total* automatic stabilisation effect is smaller than its direct effect according to new simulations for Italy based on QUEST. The results show that the size of income (consumption) stabilisation declines to 29% (55%) according to QUEST. This can be explained by the impact of behavioural and macroeconomic effects, which reduce the degree of shock absorption of automatic stabilisers.

1. INTRODUCTION

Income inequality has been rising in several countries of the European Union (EU) over the past decades. Although inequality is, on average, still lower in the EU than in other advanced economies, the increased inequality in several EU Member States has fuelled a perception of unfair opportunities and burden-sharing within societies. That perception has been amplified by the impact of the Great Recession, ([42]) which resulted in high unemployment, low growth together with a dire outlook in particular for the younger generation in some EU Member States.

Excessively high income inequality can be harmful for economies. Mainstream economic theory points to a trade-off between equity and efficiency. Policies aiming at a more equal society can distort incentives for work, education, entrepreneurship and investment, which in turn hamper economic performance. ([43]) However, excessively high income inequality can have negative economic effects through different channels, namely by: (i) weakening aggregate demand as poorer households tend to consume a higher share of their income than richer ones; ([44]) (ii) contributing to an underinvestment in human capital, hampering social mobility and lowering labour productivity if access to quality education primarily depends on income; ([45]) (iii) leading to a misallocation of resources and rent-seeking if preferences of a society are shifted towards excessive regulation or inefficiently high taxes on capital. ([46])

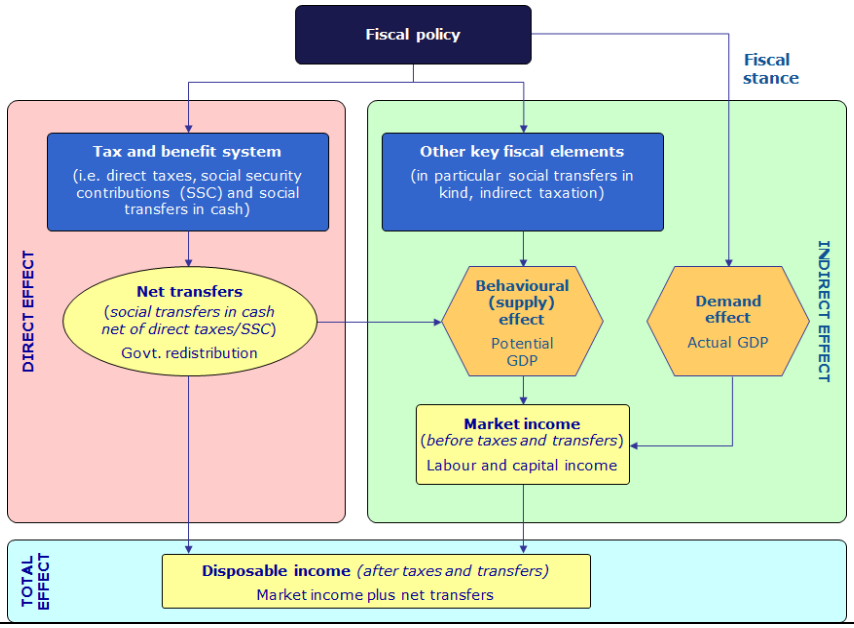
Fiscal policy is a key instrument for governments to affect the income distribution (Graph III.1.1.). Fiscal policy can have a *direct* impact on the disposable income of households through the design of the tax and benefit system. In addition, fiscal policy can also have an *indirect* effect on income distribution via two main channels. First, fiscal policy can cause behavioural responses of firms, workers and consumers, which mainly affect labour supply and capital accumulation and thus impact on market income (i.e. before tax and benefits). ([47]) For instance, higher social transfers or taxes can weaken incentives to work and to invest in skills, increase unemployment and ultimately lead to higher market income inequality. Second, fiscal policy can cause macroeconomic feedback effects. For instance, high debt can weigh on growth ([48]) and/or expose the economies to risk of deeper recessions ([49]), while fiscal policy can also mitigate skill degradation in a depressed economy ([50]). Overall, the indirect effects of certain policies may offset some of their inequality-mitigating direct effect. ([51]) Hence, fiscal policy plays a crucial role in contributing to the key functions of the government as defined by Musgrave, ([52]) by enabling equal opportunities and redistributing income and wealth (equity function), protecting incomes against economic downturns (stability function) and setting-up incentive-compatible framework conditions (efficiency function).

Apart from fiscal policy, many other factors and policies can impact the income distribution. ([53]) For instance, technological changes (sometimes associated with globalisation patterns) can increase the demand for high-skilled employees, therefore increasing their wage premium and amplifying wage dispersion. Demographic factors, such as ageing and the composition of households, tend to contribute to a rise in income inequality. ([54]) There seems to be no conclusive evidence on the impact of market regulation on inequality. ([55])

Tackling inequality is mainly a national prerogative in the EU. Depending on the preferences within societies and in line with the principle of subsidiarity, Member States decide how to address inequality. At the same time, social issues are a priority for the EU, as reaffirmed for

([42]) Juncker (2015).
([43]) Okun (1975).
([44]) Galor and Zeira (1993).
([45]) Stiglitz (2012).
([46]) Alesina and Rodrik (1994), Alesina and Perotti (1996).
([47]) Conesa and Krueger (2006), Heathcote et al. (2017).
([48]) Chudik et al. (2017).
([49]) Jordà et al. (2016).
([50]) DeLong and Summers (2012).
([51]) The assessment of behavioural and macroeconomic effects of tax reforms is also a prominent feature in the political and public debate. Dynamic scoring techniques provide a useful tool for these analyses (see Mankiw and Weinzierl 2006, Barrios et al., 2017).
([52]) Musgrave (1959).
([53]) Förster and Tóth (2015).
([54]) Lu et al. (2011), Peichl et al. (2010).
([55]) OECD (2011a).

Graph III.1.1: **Main transmission channels from fiscal policy to inequality - schematic illustration**



Note: The graph presents a schematic overview of the main transmission channels linking fiscal policy and (disposable/market) income inequality. Three channels can be distinguished, namely direct (left upper panel), indirect (right upper panel) and total (bottom panel) effects. The direct effects represent the impact of the tax and benefit system on disposable income inequality, which is analysed in greater detail in Sections III.3.1. and III.4.1. The total effects of fiscal policy on disposable income inequality are investigated in Sections III.3.2. and III.4.2.
Source: Authors' illustration.

instance in the European Pillar of Social Rights, which sets out a number of key principles and rights to support fair and well-functioning labour markets and welfare systems. ([56]) The European Semester provides the monitoring framework at EU level and the 2018 Annual Growth Survey highlights the importance of tackling inequalities, including through the design of national tax and benefit systems. ([57]) The reduction of inequality is also a top priority of G20 Leaders. ([58])

While inequality has several facets, this report analyses the impact of fiscal policy on the income distribution in the EU Member States. The centre of interest lies on inequality of *incomes*, resulting from the key fiscal, economic and societal factors listed above. This part does not address the equally important question on the effects of inequality of *opportunities*, which are associated with factors beyond the individual's control, such as social background or ethnicity. ([59]) Inequality is measured here by the distribution of *income across households*, leaving aside the also important questions of inequality *within households* or the distribution of *wealth*. ([60]) Finally, fiscal policy is mainly understood as governments' tax and benefit systems (i.e. social transfers in cash, social security contributions and direct taxes), but some consideration is also given to indirect taxation and non-monetary, in-kind elements such as the provision of education.

Against that background, the present part addresses the following three questions:

- ***First, which fiscal policy instruments are effective in reducing income inequality according to the literature?*** Chapter III.2. summarises the existing evidence and theories by type of fiscal policy, distinguishing between direct and indirect effects. It concentrates on the tax and benefit system, i.e. social transfers

([56]) European Commission (2017a).
([57]) https://ec.europa.eu/info/sites/info/files/2017-comm-690_en_0.pdf
([58]) G20 Leaders (2014).
([59]) Roemer (1998).
([60]) See European Central Bank (2016) summarising the findings on household net wealth for 18 euro area countries derived from the second wave of the Household Finance and Consumption Survey (HFCS).

in cash, direct taxes and social security contributions (Section III.2.1.), social transfers in kind (Section III.2.2.) and indirect taxes (Section III.2.3.).

- ***Second, has fiscal policy been successful in reducing income inequality in the EU?*** Chapter III.3. provides new empirical evidence on the inequality-mitigating impact of fiscal policy for Member States. It first analyses the *direct* effects of the tax and benefit systems on income inequality using household data over the period 2004 to 2014 (Section III.3.1.). It then analyses the *total*, i.e. direct and indirect, effects using a panel regression approach for the years 1980 to 2014 (Section III.3.2.).

- ***Third, is fiscal policy an effective tool in automatically stabilising households' income and consumption across deciles if economies are hit by a large economic shock?*** Chapter III.4. analyses the automatic (as opposed to ad-hoc or discretionary) stabilisation properties of fiscal policy in smoothing income and consumption following a large economic shock. It first analyses the *direct* stabilisation effect of the tax and benefit system on income and consumption using the microsimulation model EUROMOD and household data for the year 2014 across 28 Member States (Section III.4.1.). It then analyses the *total*, i.e. direct and indirect, stabilisation effect of fiscal policy using the macrosimulation model QUEST (Section III.4.2.).

2. MAIN EFFECTS OF FISCAL POLICY ON INCOME INEQUALITY: A LITERATURE REVIEW

The literature review on the effects of fiscal policy on the income distribution identifies three key policy drivers, namely (i) the tax and benefit system (i.e. social transfers in cash, direct taxes and social security contributions) (Section III.2.1.), (ii) social transfers in-kind, such as the provision of education (Section III.2.2.) and (iii) indirect taxes, i.e. mainly consumption taxes such as VAT (Section III.2.3.). Other components of fiscal policy, such as corporate income, environmental, property or inheritance taxes as well as other public expenditures are not considered here.

A distinction has to be made between direct and indirect effects of fiscal policy (Graph III.1.1). Governments have a *direct* impact on the income distribution through the design of the tax and benefit system. They also *indirectly* affect the income distribution by causing behavioural responses and macroeconomic effects, which, in turn, influence economic outcomes and thereby result in distributive effects. ([61]) That raises the question of how debt is financed, which is an important determinant of the total effects of fiscal policy. For instance, a tax hike necessary to finance benefits can distort economic activity, lower output, reduce labour income and finally affect disposable income.

Apart from fiscal policy, many other factors and policies can affect the income distribution, which are not further analysed here (Graph III.2.1). ([62]) For instance, technological changes (sometimes associated with globalisation patterns) can increase the demand for high-skilled employees, therefore increasing their wage premium and amplifying wage dispersion. There seems to be no conclusive evidence on the impact of market regulation on inequality. ([63]) Demographic factors, such as ageing and the composition of households, can contribute to a rise in income inequality. ([64]) Finally, developments in the political process have also been identified as drivers for inequality.

2.1. DISTRIBUTIVE EFFECTS OF THE TAX AND BENEFIT SYSTEMS

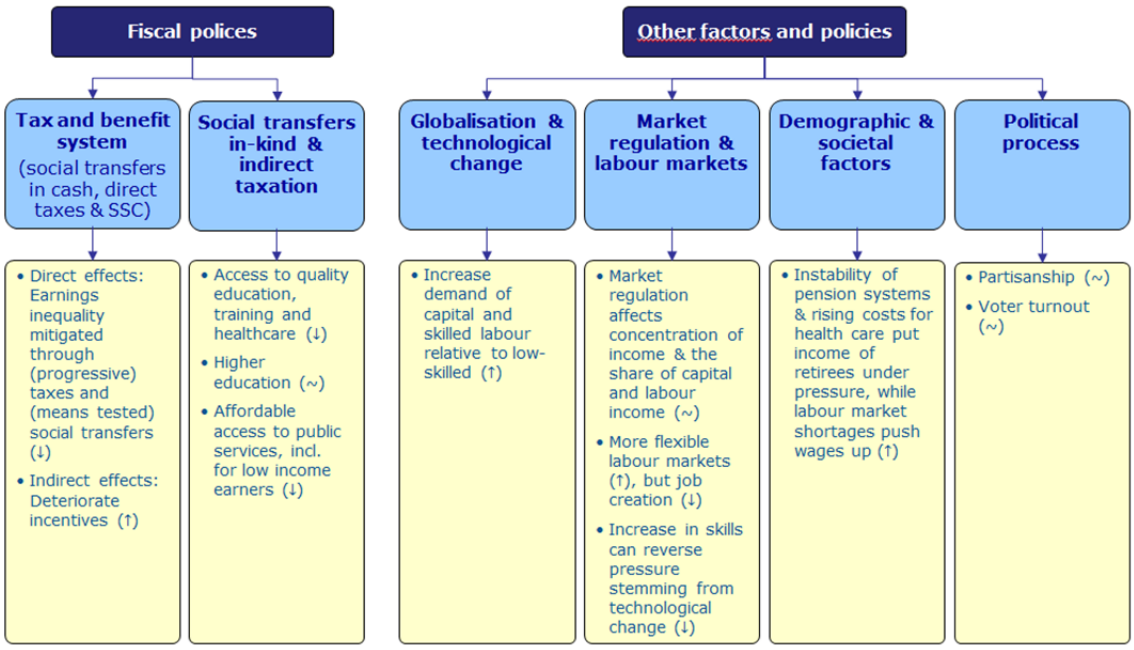
2.1.1. Direct redistributive effects of the tax and benefit systems

The direct redistributive effects of the tax and benefit system depend largely on the size and progressivity of its components. ([65]) Focusing on the *direct* effects from the tax and benefit system means to ignore the impact from *indirect* effects. The tax (benefit) system is considered to be progressive if the taxes paid (benefits received) increase (decrease) with increasing disposable income. Conversely, the tax (benefit) system is regressive if the taxes paid (benefits received) decrease (increase) with increasing disposable income.

- **The progressivity of social transfers varies a lot across components.** Old-age pensions, which account for a significant part of the cash transfers, exhibit a low progressivity in many countries, and they often redistribute income over the life-cycle rather than within the life-cycle and across households. ([66]) By contrast, family and housing benefits appear to be more progressive cash transfers, though their redistributive impact is often limited due to their small size. Disability and unemployment benefits tend to reduce income inequality, whereas their degree of progressivity depends to a large extent on the country-specific design. The redistributive impact of cash transfers not only depends on the levels of those benefits, but also on their mix and specific design. For instance, some countries can achieve a sizeable redistributive impact despite a relatively small cash transfer by focusing on means-tested benefits.

([61]) For instance, fiscal policy also depend on the sustainability of government finances, since a high government debt weighs on growth (Chudik et al., 2017) and/or expose economies to deeper recessions in case of a financial crisis (Jordà et al., 2016). At the same time, fiscal policy may mitigate skill degradation in a depressed economy (DeLong and Summers, 2012).
([62]) Förster and Tóth (2015).
([63]) OECD (2011a).
([64]) Lu et al. (2011), OECD (2011a) and Peichl et al. (2010).
([65]) Some countries with a small tax-benefit system (relative to GDP) can achieve the same redistributive impact as countries with much higher taxes and transfers, because they rely more on progressive taxation and means-tested social transfers. For a discussion on how to enhance the distributive impact of taxation policies see for example Bastagli et al. (2012).
([66]) Joumard et al. (2012), Arnold et al. (2016), IMF (2017).

Graph III.2.1: **Stylised overview of main drivers of income inequality**



Note: The figure provides a stylised overview of the main drivers of income inequality identified in the literature. ↑(↓) stands for inequality-increasing (-decreasing) effect, while ~ points to inconclusive results. Particular importance is given to drivers, which have been identified for EU countries. SSC refers to social security contributions.
Source: Author's illustration inspired by OECD (2015).

- **The redistributive impact of taxes is higher, the more progressive the (effective) tax rate**. ([67]) In general, direct taxes tend to be progressive in most countries. ([68]) The personal income tax is the most progressive tax in most Member States. On the other hand, social security contributions tend to be regressive in most countries. The progressivity of labour taxes (including social security contributions and personal income tax associated with labour income) has increased in many countries since 2000, as social security contributions for low-income earners have been cut mainly to reduce the cost of labour. ([69])

Cash transfers tend to have a larger direct redistributive impact than direct taxes According to evidence based on averages across the OECD from the pre-Great Recession period, around three-quarters of the reduction in inequality of income comes from transfers and the rest from direct taxation. ([70])

2.1.2. Total redistributive effects of the tax and benefit systems

A solid impact assessment needs to take into account the total, i.e. direct and indirect, effects of the tax and benefit system on income inequality. The design of the tax and benefit system can trigger a number of adverse indirect effects owing to macroeconomic feedback effects and behavioural adjustments on the contributor (taxpayers) or recipient side (e.g. social assistance beneficiaries). Those behavioural effects can act as a disincentive to work (e.g. unemployment benefits) ([71]) or weaken acquisition of skills and

([67]) See Immervoll and Richardson (2011), Kenworthy and Pontusson (2005).
([68]) Despite the progressive nature of tax legislation, high income households sometimes have better means to identify and make use of tax loopholes. For a review of the literature on the theory of optimal taxation see Saez (2004).
([69]) See Causa et al. (2016). Other authors that analyse the impact of indirect taxation on income inequality are Wagstaff et al. (1999), O'Donoghue et al. (2004) who find direct taxes to be significantly progressive; Belot and van Ours (2004), Causa et al. (2016).
([70]) See Joumard et al. (2012).
([71]) This is can affect the decision whether to work or not or how many hours to work (see for instance Abbring et al., 2005, Heathcote et al., 2017).

lower investment (e.g. higher taxes) ([72]) and ultimately lead to higher inequality. ([73])

The most famous distortion is likely the so-called unemployment trap. If the tax and benefit system is not well-designed, unemployed individuals can face a disincentive to take up upcoming job offers. Over the medium- to long-term, it can thus have an impact on labour supply and undo the reduction in inequality brought by the direct cash contribution.

Higher taxes can trigger behavioural responses contributing to higher inequality. As mentioned above, high debt levels can put the sustainability of the tax and benefit system at risk. At the same time higher taxes (which can become necessary to finance the tax and benefit system) can also contribute to higher unemployment, for instance if they lead to competitiveness losses for firms (e.g. for social contributions or when higher labour income taxes are translated into higher wages). This holds in particular if tax rates are already quite high. ([74]) The associated employment losses can cause higher inequality, even if the tax system is progressive. In addition, empirical evidence shows that higher tax wedges ([75]) tend to have no clear-cut inequality-mitigating effect, although they are intended to favour lower segments of the labour markets. Depending on national labour market institutions, high-wage workers may be able to pass on the tax burden to their employers, while the overall tax wedge effects can considerably affect unemployment. ([76]) High taxes and weaknesses in public administrative capacity can also increase income tax evasion, which, in turn, can have indirect effects on income inequality. Simulations suggest that tax evasion in Greece, Hungary and Italy seem to lead to a significant loss of tax receipts and to higher income inequality. ([77])

The potential disincentive effects from cash benefits depend on the whole set of labour market institutions. ([78]) The literature suggests that social transfers, in particular unemployment benefits, can weaken work incentives and increase unemployment duration and total unemployment, ([79]) which, in turn, can potentially increase inequality. At the same time, the empirical evidence shows that the disincentive effects of unemployment benefits (for instance regarding the durat ion of benefits and the net replacement rates) may vary a lot across countries. ([80]) In addition, unemployment benefit systems operate within a broader context given by the existing economic and institutional framework. Incentives to work are notably influenced by the overall tax and benefit system and in particular by the combination of other benefits such as social assistance, housing benefits, family benefits and in-work benefits. Individual job-search effort and availability are also influenced by the provision of active labour market policies as well as by the overall economic and labour market conditions.

There is nevertheless evidence that a careful design of the tax and benefit system can ultimately contribute to lower income inequality. ([81]) This could be for instance achieved by favouring fiscal instruments that are both progressive and less harmful to job creation, as well as by combining them with other policies that avoid disincentive effects, such as means-tested unemployment benefits combined with sound active labour market policies.

2.2. DISTRIBUTIVE EFFECTS THROUGH TRANSFERS IN KIND

If well-designed and financed in a growth-friendly manner, transfers in kind can contribute to a reduction of market income

([72]) Put differently, some policies that have adverse effects on equity in the short run could be redistributive in the longer run through job creation and incomes (see Muinelo-Gallo and Roca-Sagalés, 2013; Biswas et al., 2017 and Arnold et al., 2016).
([73]) Empirical evidence also suggests that distributive expenditures and direct taxes can reduce GDP growth, hence potentially job creation. While links between growth and inequality are not straightforward, a hampered job creation ultimately contributes to a rise in inequality.
([74]) See e.g. Trabant and Uhlig (2011) for a recent assessment of the Laffer curve.
([75]) The average tax wedge measures the extent to which tax on labour income discourages employment. It is defined as the ratio between the amount of taxes paid by an average single worker (a single person at 100% of average earnings) for the employer (measured in per cent of labour costs).
([76]) See Checchi and Garcia-Penalosa (2010).
([77]) Matsaganis et al. (2010).
([78]) See, for the US case, Chetty et al. (2013).
([79]) Abbring et al. (2005).
([80]) See, for instance, Jenkins and Garcia-Serrano (2004), Hagedorn et al. (2015) and Schmitz and Steiner (2007).
([81]) Doerrenberg and Peichl (2012).

inequality. Social transfers in-kind correspond to individual goods and services supplied or reimbursed to households, typically by the general government. They include transfers of individual non-market goods and services produced by the general government, particularly education and health, as well as benefits in kind which fall into the category of social protection, such as housing benefit, child care or medication. The provision of transfers in kind – notably those linked to human capital – can improve social mobility and skills, possibly reducing inequality of (future) earnings.

The distributive effects of transfers in kind typically take more time to materialise than cash transfers and depend largely on the quality and the beneficiaries of those policies. Those services also need to be financed, and taxation can bring indirect behavioural effects such as disincentives for work and economic activity, some of them triggering more market inequality. Some channels through which the provision of education, training and health services can affect income inequality over the medium- or long-run are the following:

- **Education (early childhood and schooling):** In most OECD countries, students who attended early (pre-school) education tend to perform better than their peers, even after accounting for the socio-economic background. ([82]) Participation in quality-early childhood education is a key determinant of successful school attendance, especially for children from disadvantaged socio-economic backgrounds. Early school leavers are also more likely to be inactive or unemployed or to have less stable and remunerative jobs. Disadvantages from early life tend to persist throughout life, as people with lower qualifications are also less likely to engage in adult learning. Providing quality education can allow such traps to be avoided. Some of those services, such as increased childcare provision and early-learning education can not only help to enhance skills of the future labour force, but also increase labour market participation in particular of women.

- **Active labour market policies and vocational training:** Well-designed active labour market policies targeted at rapid reallocation of dismissed workers into new employment in combination with a social safety net during the transition period can smooth consumption and be compatible with less intense business cycle fluctuations and faster adjustment processes (but also more volatile government spending). Vocational training, as well as lifelong re-training opportunities help to mitigate the negative effect of skill-biased technological change and may act against labour market hysteresis caused by severe downturns. ([83])

- **Health care and long-term care** can affect labour supply and productivity at the individual level. The health status of individuals is found to be a strong determinant of their labour market participation. ([84]) As low income earners tend to have a worse health status than high income earners, health care can improve their labour market participation, thereby reducing income inequality. In addition, health care can help limit health-related productivity losses at the individual level and is found to be a determinant allowing older people to remain economically active. ([85])

Evidence suggests that the provision of affordable public services can have a non-negligible impact on reducing the immediate income inequality of households. ([86]) Microsimulation models based on 2009 data for 21 Member States show that the delivery of public services benefits the low income earners in particular. ([87]) The direct redistributive power of

([82]) See OECD (2016) based on the PISA 2012 survey.

([83]) See for instance OECD (2011b).
([84]) See Suhrcke et al. (2006) and Mackenbach et al. (2007).
([85]) There is indeed evidence for a role for sickness in explaining the decision to retire from the labour force and exclusion from it. However, the importance of health in predicting exit from the labour force is influenced by the employment and benefits regime in place. Some policies encourage people to register as unable to work through illness rather than as unemployed (see e.g. Kalwij and Vermeulen, 2005).
([86]) See Aaberge et al. (2017).
([87]) The authors calculate a "monetary value" of the delivery of health care, long-term care, education and childcare for the benefiting households. To account for the fact that the receipts of public services like education and healthcare are associated with particular needs, the consumption needs are also adjusted accordingly (see Table III.A1.1 in Annex III.1).

the delivery of health care, long-term care, education and childcare may strengthen the distributive power of transfers in cash by around one-third. The effects of public housing subsidies, education and health care have also been evaluated in another study for Belgium, Germany, Greece, Italy and the United Kingdom. It concludes that the income inequality is smaller if one takes those public services into account, also when consumption needs are adjusted to reflect the provision of healthcare and education. ([88])

Despite the possible benefits of transfer in kind, their potentially distortive features must not be neglected. First, transfers in kind need to be supported by sufficient financing. Transfers in kind amounted to 13% of GDP in the euro area and in the EU in 2016, almost one-third of primary expenditures. This figure hides large differences across Member States, with transfers in kind ranging from 6.5% of GDP in Cyprus to 19.1% of GDP in Sweden. Securing a constant financing may require a high level of taxation with the possible negative feedback effect on growth and, indirectly, unemployment and inequality. Second, an efficient implementation of transfers in kind can be challenging, since they can create undesirable incentives of potential recipients ([89]) and/or can be ill-designed due to political-economy considerations. ([90])

2.3. DISTRIBUTIVE EFFECTS FROM INDIRECT TAXATION

Indirect taxes can be an important component of government revenues. They include in particular consumption taxes (VAT and excise duties). Together with income taxes, VAT is typically the biggest source of government revenues in EU Member States.

Consumption taxes (VAT and excise duties) are generally regressive, meaning that the share of those taxes as a percentage of disposable income is higher for low-income earners. ([91]) However, consumption taxes may be either close to proportional or slightly progressive when their effects are measured as a percentage of expenditure instead of disposable income. ([92]) This is because high-income households tend to spend relatively more on high-tax products and services than low-income households.

Reduced rates on VAT are not the most efficient tool to address income inequality. Reduced VAT rates on specific goods and services are frequently used to alleviate the regressive nature of the VAT. However, such policies appear to have a clear redistributive impact, since the high-income households tend to spend more in absolute terms on these products than the low-income households. Income-related benefits are therefore considered a more efficient way of increasing the disposable income of low-income households than reduced VAT rates. ([93])

Depending on the overall tax mix, there can be indirect redistributive effects through competitiveness and labour supply. For example, shifting the tax burden from income taxes (progressive) to consumption taxes (regressive) can have adverse effects on inequality in the short run. They can be, however, outweighed by improved employment opportunities, arising as a result of more favourable taxation of labour: effects on job creation can be positive in the medium run through competitiveness gains, and in the long run through increased labour supply. ([94]) General equilibrium simulations show that an increase in consumption tax, accompanied by a reduction in the tax burden on labour, would ultimately redistribute income from capital owners to wage earners. ([95])

([88]) See Paulus et al. (2010); see also Förster and Verbist (2012) for the childcare benefits in kind.
([89]) A strand of literature argues that transfers can give wrong incentives to potential recipients in order to receive the transfer (Bruce and Waldman, 1991).
([90]) The political-economy inspired literature argues that transfers can be inefficient, since they can lead to an inefficiently high number of projects due to the common-pool problem (Weingast et al., 1981). Similarly, policy-makers may attribute too much weight to special interests in the design of transfers to improve their re-election probabilities (Coate and Morris, 1995).
([91]) See OECD (2014), O'Donoghue et al. (2004) and Decoster et al. (2010).
([92]) See also Graph III.A1.1 in Annex III.1 for 14 Member States; see also OECD (2015).
([93]) Mirrlees et al. (2011), Copenhagen Economics (2007), Kalyva et al. (2016), IMF (2014).
([94]) Causa et al. (2016). For a summary about the sign of the effect of tax reforms on economic growth and equality in disposable income see Joumard et al. (2012).
([95]) See Varga and in't Veld (2014) or Burgert and Roeger (2014). Further research related to tax shift and effects on income distribution can be found in Wöhlbier et al. (2016).

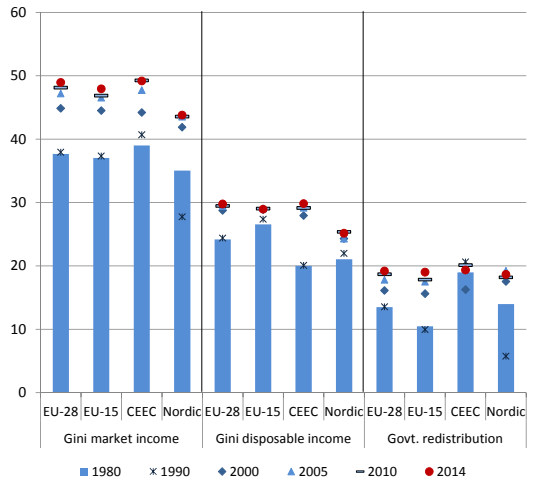
3. EFFECTIVENESS OF FISCAL POLICY IN REDUCING INCOME INEQUALITY IN THE EU: WHAT DO THE DATA SAY?

This chapter provides new empirical evidence on the impact of fiscal policy on income inequality across Member States. It first focuses on the *direct* impact of the tax and benefit systems (i.e. direct taxes, social security contributions and social transfers in cash) on income inequality using household data over the period 2004 to 2014 (Section III.3.1.). It then analyses the *total*, i.e. direct and indirect, impact of fiscal policy on inequality using a panel regression approach for the years 1980 to 2014 (Section III.3.2.). ([96]) Note that for data availability reasons, the analysis is limited to the years until 2014. ([97])

3.1. DIRECT EFFECTS THROUGH THE TAX AND BENEFIT SYSTEMS

While disposable income inequality is today higher in almost all Member States than in 1980, it has remained broadly stable since 2000 (Graph III.3.1). In the EU on average, the increase in inequality – if measured as the Gini index of market (i.e. before taxes and transfers) or disposable (i.e. after taxes and transfers) income – mainly results from a level shift in inequality in the 1990s. This is clearly the case for the Central and Eastern European countries (CEEC), where inequality soared after the end of the communist eras with the economic transition process. In the Nordic countries, inequality has also increased significantly in the 1990s; they are, however, still among the most equal societies around the world. In the EU-15, the increase of inequality between 1980 and 2000 mostly affected market income, while the rise in disposable income inequality was relatively small. Since 2000, market inequality has further increased, while disposable income inequality has remained broadly stable. Overall, government redistribution through the tax and benefit system therefore played a major role in mitigating the impact of the rise in market inequality. Since the 1980s, government redistribution in the EU on average has increased significantly and it is close to its historical peak in 2014, the latest available year of observation.

Graph III.3.1: **Developments of income inequality since 1980 for selected EU country groups**



Note: This graph shows the long-term evolution of the Gini index based on disposable/market income (in per cent) as well as government redistribution for selected EU country groups since 1980. Government redistribution is measured as the difference of the Gini index of market and disposable income. If data are not available for a specific year, the closest value is shown. Nordic (DK, FI, SE), EU-15 (EU Member States before 2004 enlargement) and CEEC (BG, CZ, EE, HU, LT, LV, PL, RO, SI, SK) are based on simple unweighted averages for the given countries.
Source: Own illustration using data from the Standardized World Income Inequality Database (SWIID) version 6.0 by Solt (2016).

3.1.1. Income inequality and redistribution since EU's eastern enlargement

The inequality of disposable income has remained lower in the EU than in other major advanced and developing economies since 2004 (see blue bars in Graph III.3.2). The Gini index of disposable income on average slightly increased in the EU-28 between 2004 and 2014. This reflects the higher inequality in the CEEC, which more than offset the decline in inequality in the EU-15. Nevertheless, according to the latest available data from 2014, disposable income inequality is still smaller in the EU-15 (28.9%) and EU-28 (30.4%) than in Japan (30.8%), Australia (31.8%), the United States (37.0%) and South Africa (57.3%).

The relatively low inequality of disposable income in the EU reflects the sizeable government redistribution, which is much

([96]) See Graph III.1.1 for an illustration of the direct, indirect and total effects.
([97]) According to the latest available data of Eurostat, the Gini index of the EU as a whole remained broadly stable in the years 2015 and 2015 (for the year 2015 see also European Commission, 2017b).

Box III.3.1: **Indicators of income inequality and redistribution through fiscal policy**

This box presents the indicators used here to measure income inequality and redistribution through fiscal policy.

The key indicators used here are calculated based on household data from the EU statistics on income and living conditions (EU-SILC) database. ([1]) EU-SILC is the major survey in the EU covering cross-sectional and longitudinal data on income, poverty, social exclusion and living conditions at the personal and/or household level (see Annex III.2 for a more detailed description). Like for every survey, the estimates of overall income inequality tend to be biased downwards, since surveys do not capture incomes of the extreme top of the distribution very well. ([2]) In addition, the information on the income distribution is only available for EU Member States, a limited time period and with a significant time lag, covering the period 2004 to 2014. ([3])

Indicators of inequality

A key measure for inequality is the Gini index. It considers the shape of the whole income distribution and takes values from 0 (perfect equality, i.e. every household has the same income) to 100 per cent (maximal inequality, i.e. the total income is concentrated on one household and all others have nothing). Higher values therefore point to a higher degree of inequality. ([4]) A key advantage of the Gini is that it is a well-established indicator, which is available for a relatively long time period and for many countries. A major drawback is that the Gini is little sensitive to changes at the very top and bottom of the income distribution.

In this section Gini indices are calculated based on market and disposable income. The Gini index based on *market* income represents inequality of households' total income *before* redistribution from taxes and transfers (sometimes also called *gross* inequality). The Gini index of *disposable* income measures income *after* redistribution from taxes and transfers (sometimes also labelled *net* inequality) (see Annex III.2 Table III.A2.1 for an overview of the specific components of disposable and market income). A distinction between the two concepts is useful to better understand the role of the markets and welfare systems. Households' observations are adjusted using the modified OECD equivalence scales to take into account the different consumption needs due to different size and age structure within a household. ([5])

To illustrate what a change of the Gini index can mean consider the following illustrative example. We assess the impact of a hypothetical increase of the monthly disposable household income by 100 EUR at 2013 prices in France and Italy for three different types of households, namely households with (i) low income (deciles 1 and 2), (ii) medium income (deciles 5 and 6) and (iii) high income (deciles 9 and 10). The findings reveal that a transfer to the low-income households would, ceteris paribus, decrease the Gini index by around 0.7 percentage point (Table III.3.a). The impact would be smaller (around 0.2 percentage point) if the transfer is given to the medium-income households. Finally, a transfer to the high-income households would increase the Gini by around 0.4 percentage point. The results are similar for France and Italy.

([1]) Data for the UK stem from the Family Resource Survey. The EU-SILC database only includes information for the period 2004 to 2014. This Chapter therefore relies on a second source of inequality data by Solt (2016) if a longer time period or a larger country sample is required.
([2]) Atkinson et al. (2011). On the impact of top incomes on inequality see e.g. Roine et al. (2009).
([3]) Note that this this period corresponds to the years of the EU-SILC database.
([4]) An indicator which tends to be closely correlated with the Gini index is the income share ratio S80/S20. It is defined as the ratio between the total income received by the population of the top 80% over the income of the lowest 20% of the income distribution.
([5]) The equivalised disposable income is defined as the total disposable income of a household divided by the number of household members converted into equalised adults. Household members are equalised or made equivalent by weighting each household member according to their age, using the so-called modified OECD equivalence scale (1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over; 0.3 to each child aged under 14).

(Continued on the next page)

Box (continued)

Apart from the Gini index, two indicators measuring income share ratios are used. These indicators measure the ratio between the upper-bound value of the equivalised household disposable income of the ninth decile to that of the median income (S90/S50) and the median income to the upper-bound value of the first decile (S50/S10). The indicators help to better understand, which part of the income distribution is mainly responsible for the change in income inequality.

Table III.3.a: **Sensitivity of the Gini index to changes in household income – an illustrative example**

	France		Italy	
	Gini	*Change vs. SQ*	Gini	*Change vs. SQ*
Status-quo (SQ)	29.2		31.7	
Scenarios: 100 EUR more for each household with …				
• S1: Low income (deciles 1 and 2)	28.5	*-0.7*	30.8	*-0.9*
• S2: Medium income (deciles 5 and 6)	29.0	*-0.2*	31.4	*-0.3*
• S3: High income (deciles 9 and 10)	29.6	*0.4*	32.0	*0.3*

Note: The table reveals the sensitivity of the Gini index to changes in household income. More concretely, it shows how the Gini index of disposable income would change in France and Italy if the monthly equivalised disposable household income of the low-, medium- or high-income households would increase by 100 EUR, corresponding to a fiscal impulse of around 2.5% of GDP for France and 3% for Italy for each scenario considered. Status-quo refers to the year 2013 using EU-SILC data from 2012 uprated to 2013 with inflators specific to income components. The definition of disposable household income used here differs slightly from the EU-SILC definition, which results in slightly different Gini indices compared with EU-SILC and EUROMOD.
Source: Author's calculations based on EU-SILC data and EUROMOD simulations.

Finally, the evolution of median household income is used as a complementary indicator. Inequality is a *"relative"* concept comparing the income of a household (or an income decile) to the entire income distribution of a country (or a specific income share). This leaves aside that the low-, middle- and high-income households may all be better off in *"absolute"* terms even if they maintained their respective places within the income distribution. Therefore, the development of the median household income is used as an additional indicator to find out if the change in inequality occurred in the context of an increase of median income.

Indicators of redistribution

A key indicator for the size of redistribution through the overall tax and benefit system is the difference between the Gini index of market and disposable income. This difference indicates the redistributive power of the tax and benefit system of each country: the higher it is, the higher the direct redistributive impact of the tax and benefit system.

In addition, Gini elasticities are used to examine the relative importance of single tax and benefit components to changes in income inequality. The elasticities measure the impact of a marginal increase in a tax or benefit component on inequality of disposable income, holding income from other sources constant. The Gini elasticity depends on three factors, namely (i) the share of the tax/transfer item in total income, (ii) how equally or unequally they are distributed and (iii) their correlation with the distribution of total income (see Annex III.2 for more information). ([6])

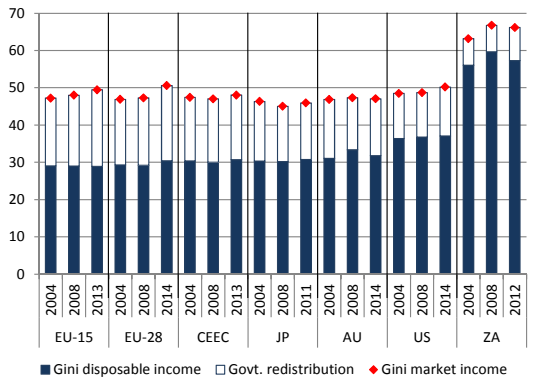
([6]) See for more details López-Feldman (2006).

higher than in other major advanced and developing economies (see white bars in Graph III.3.2). In the EU-28, inequality of market income has increased since 2004 to a level which is now at the similar level as the US (see red diamonds in Graph III.3.2). Inequality of disposable income has, however, remained relatively low compared to other major and developing economies. This means that the redistributive effects of the tax and benefit system mitigated the effects of the rise in market inequality. Indeed, the EU-28 has the highest government redistribution across the regions considered (almost twice as large as in the US).

Median income has grown faster than prices in the EU since 2005 (Table III.3.1). A focus on the Gini indices ignores that the rich, middle-class and poor might all be better off in "absolute" terms even in an environment of higher inequality. Since

2005, the median income of households increased faster than HICP inflation. This is particularly the case between 2005 and 2010, but also for the period 2010 to 2014.

Graph III.3.2: **Income inequality and government redistribution across regions (2004, 2008 and 2014)**



Note: The graph shows the evolution of income inequality and government redistribution across selected regions between 2004 and 2014. Inequality is measured as the Gini index of market and disposable income (in per cent). Government redistribution is calculated as the difference between the Gini indices of market and disposable income. Regions are shown in inequality-increasing order based on the Gini index of disposable income of the latest available year of observation. The following countries or regions are included: 15 EU Member States before Eastern enlargement in 2004 (EU-15), current 28 EU Member States (EU-28), 10 EU Member States from Eastern and Central Europe (CEEC), Japan (JP), Australia (AU), United States (US) and South Africa (ZA). Gini indices for EU-15, EU-28 and CEEC are based on simple unweighted averages. If data for 2014 are not available, the latest available year is taken. Reading example: In 2004, the Gini index of market (disposable) income for the EU-15 average was 47.2% (29.1%). The difference can be attributed to government redistribution through the tax and benefit system.
Source: Author's calculations based on Solt (2016), SWIID version 6.0.

Member States exhibit sizeable differences in inequality of market income (see red diamonds in Graph III.3.3). The three least unequal countries based on the average Gini market index over the period 2004-2014 were Cyprus, the Netherlands and Denmark (which all had Gini coefficients of less than 43%). Ireland, the United Kingdom and Portugal, by contrast, were the most unequal countries (with Gini coefficients of market income above 52%).

Significant differences between Member States also exist in terms of the inequality of disposable income, but with a different ranking than based on market income (see blue bars in Graph III.3.3). A comparison of the Gini indices of disposable income shows that Slovenia, Sweden and the Czech Republic are the most equal countries in the EU (Gini indices below 26%). By contrast, Latvia, Portugal and Bulgaria are the most unequal countries (Gini coefficients exceeding 35%).

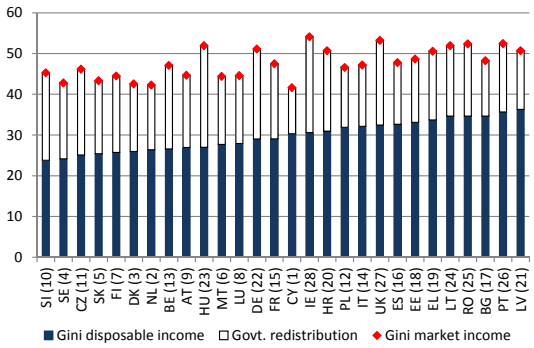
Table III.3.1: **Evolution of median income and prices since 2005 (median income = HICP inflation = 100 in 2005)**

	Initial level	Median income (S50)		HICP	
	2005	2010	2014	2010	2014
EU-28	100	121	128	113	118
EU-15	100	117	122	111	116
CEEC	100	176	200	123	130
Nordic	100	117	139	112	116

Note: The table compares the evolution of the median income (S50) of households with the HICP inflation rates across selected EU country groups since 2005.
Source: Author's calculations based on EU-SILC.

The tax and benefit systems reduced inequality in the EU on average by around one-third (see white bars in Graph III.3.3). A telling summary indicator for the magnitude of governments' redistribution is the difference between the Gini indices of market and disposable income. While the tax and benefit systems reduced inequality in the EU on average by around one-third, the size of redistribution is heterogeneous across Member States, ranging from 27% in Cyprus to 48% in Hungary (Graph III.3.3).

Graph III.3.3: **Income inequality and government redistribution across EU Member States (average 2004-2014)**

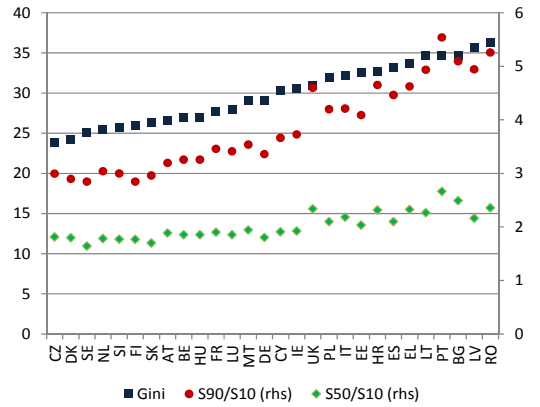


Note: The graph shows the average Gini indices of market and disposable incomes (in per cent) and government redistribution across Member States between 2004 and 2014. Government redistribution is calculated as the difference between Gini market and disposable income. Countries are ranked according to the Gini index of disposable income in inequality-increasing order; the ranking based on the Gini index of market income is shown in brackets.
Source: Author's calculations based on EU-SILC.

The ranking of EU Member States from most to least unequal is quite robust irrespective of the income inequality indicator used (Graph III.3.4). Apart from the Gini index, we also consider two indicators comparing the upper-bound value of the equivalised household disposable income of the ninth decile to that of the median income

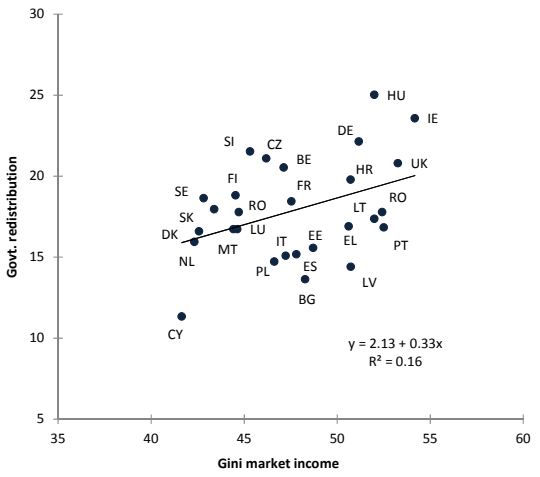
(S90/S50) and the median income to the upper-bound value of the first decile (S50/S10). Overall, the correlation between the three indicators is very high.

Graph III.3.4: **Gini index and income share ratios (based on disposable income, average 2004-2014)**



Note: The graph shows three indicators of inequality (Gini index, income share ratios S90/S10 and S50/S10) of 28 Member States for the average period 2004 to 2014. Countries are ranked according to the Gini index in ascending order. Overall, the correlation between the three series is very high, as indicated by the pairwise correlation coefficients (pcc) of Gini and S90/S10 (pcc = 0.96), Gini and S50/S10 (pcc = 0.86) and S90/S10 and S50/S10 (pcc = 0.96).
Source: Author's calculations based on EU-SILC.

Graph III.3.5: Relationship between market inequality and government redistribution (average 2004-2014)



Note: The graph shows that there is a weak positive relationship between the Gini index of market income and the government redistribution. Government redistribution is measured as the difference between the Gini index of market and disposable income. Government redistribution and the Gini index of market income are measured as country averages over the period 2004 to 2014.
Source: Author's calculations based on EU-SILC.

More unequal Member States tend to redistribute somewhat more (Graph III.3.5). The positive correlation between market inequality and the size of government redistribution indicates that Member States with higher market inequality tend to redistribute more. The relationship is, however, weak as shown by a rather large variation of government redistribution for a given level of market inequality.

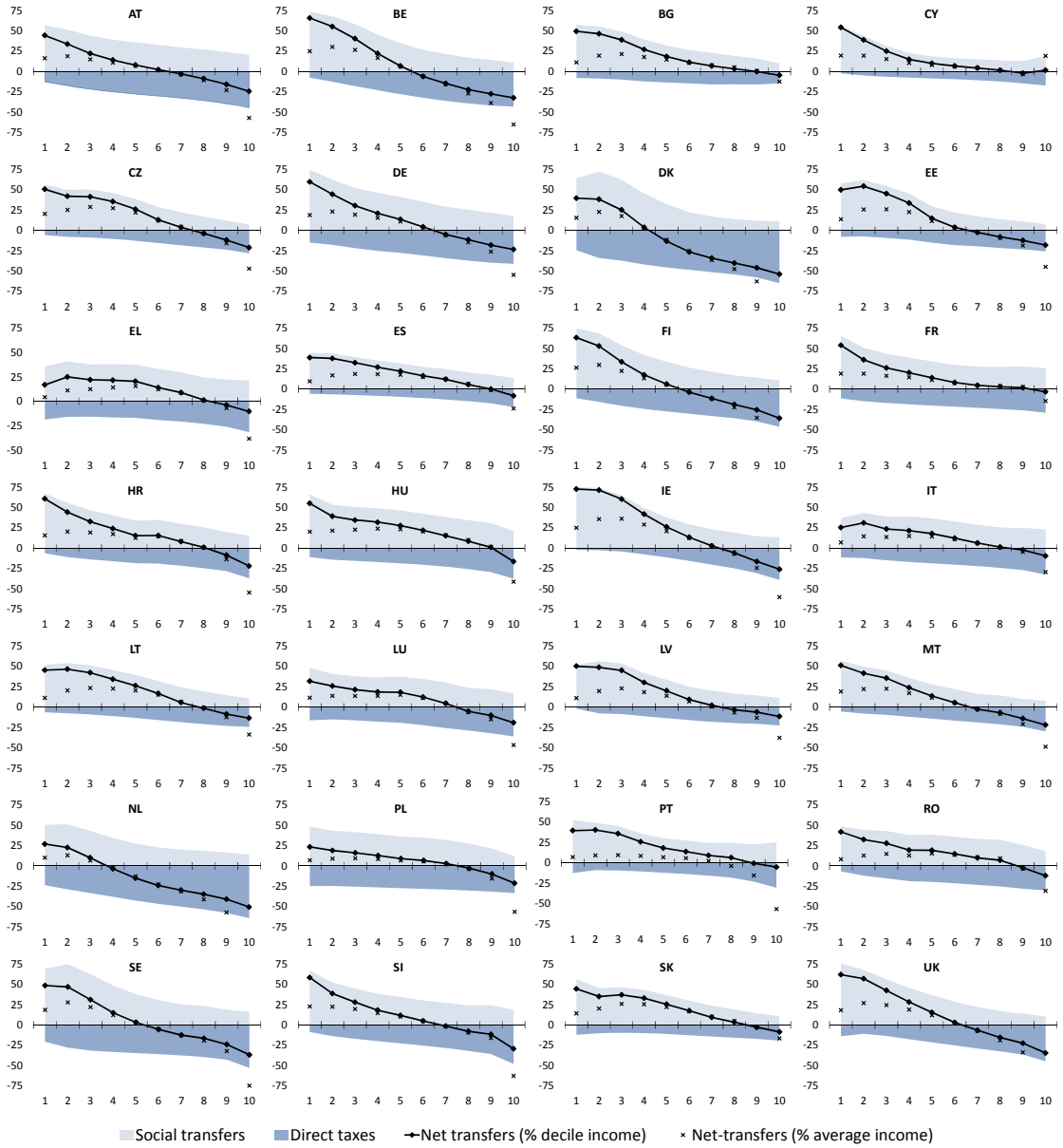
Government redistribution through the tax and benefit system tends to run from the high- to the low- and middle-income households (Graph III.3.6). A telling summary indicator for the direction of redistribution through the entire tax and benefit system is the net transfers, which are defined as the sum of social transfers net of direct taxes per disposable income of a given income decile. Overall, there is redistribution through the tax and benefit system from high- to low- and middle-income households, since net transfers tend to be positive for low- and middle-income and negative for high-income households (see black line with diamonds in Graph III.3.6). In some Member States households in almost all income deciles exhibit positive net transfers (i.e. they are net receivers), which can be explained by the sizeable impact from pensions.

The lower-middle class appears to receive the largest support from the tax and benefit system. Comparing the net transfers across deciles in per cent of GDP (as opposed to in per cent of disposable income per decile as in the previous paragraph) shows that the second, third and fourth income deciles receive the largest net transfers (see black crosses in Graph III.3.6).

The direction of government redistribution is affected by two factors, namely:

- ***The design of social transfers***: Social transfers have a redistributive impact since poorer households tend to receive more social transfers relative to their income than richer ones (see light blue area declining over decile in Graph III.3.6). In most Member States, social transfers are largely targeted at the bottom deciles. The bottom decile gains the most from social transfers in the United Kingdom and Ireland and the least in Italy and Spain. In some Member States (e.g. AT, FR, HU), sizeable transfers are also paid to high-income households, which can be explained by a sizeable impact from pensions.

Graph III.3.6: **Main receivers from and contributors to government redistribution by decile (average 2004-2014)**



Note: This graph shows the net receivers from (+) and net contributor to (-) the tax and benefit system by income deciles for 28 Member States. The black line shows net transfers, which are defined as average social transfers minus direct taxes and social security contribution by the employee in per cent of disposable household income for a given decile. The black crosses show net transfers in per cent of GDP. Positive (negative) net transfers imply that the average household of a given decile is a net receiver from (net contributor to) the tax and benefit system. Taxes are computed as the sum of taxes on income, social insurance contributions from the employee and taxes on wealth. Social transfers are calculated as a difference between total disposable household income and total disposable household income before social transfers including old-age and survivor's benefits. Outliers (households for which net transfers larger than +/-150% of disposable income) were removed due to distortions in the results for the first and last deciles.
Reading example: In Austria, the households in the six lowest income deciles are on average net receivers from the tax and benefit system, i.e. their social benefits received are larger than their direct taxes and social security contributions paid. The households in the four upper deciles are net contributors, implying that tax payments outweigh social benefits received. The second income decile receives the highest net transfers in per cent of GDP.
Source: Author's calculations based on EUROMOD.

- ***The design of direct taxes***: Direct taxes have a redistributive impact due to their progressive design, i.e. richer households tend to pay more relative to their income than poorer ones (see dark blue areas increasing the tax burden over decile in Graph III.3.6). The most important instrument of the tax and benefit system affecting incomes is direct income taxation, which is particularly high in Denmark and the Netherlands.

The largest share of inequality reduction comes in the EU on average from social transfers in cash (around 80%), while the remaining part (less than 20%) can be attributed to direct taxes (Graph III.A2.1 in Annex 2). ([98]) A key component of the inequality-mitigating impact comes from pensions. Excluding pensions from the calculation reduces the impact from social transfers to around 62% and increases the role of direct taxes to around 28%.

To identify the inequality-mitigating impact of each sub-component of the tax and benefit system, so-called Gini elasticities are calculated (Graph III.3.7 and for country-specific results Table III.A2.2 in Annex III.2). Gini elasticities measure the impact of a one-per cent increase of the sub-component on the reduction of inequality keeping all other sub-components unchanged.

- ***Direct taxes represent the most powerful tool in reducing inequality.*** Direct taxes tend to be redistributive due to their progressive nature, i.e. the tax burden increases with increasing disposable income. All things being equal, a one-per cent increase in direct taxes reduces income inequality by around 0.15%. The impact tends to be somewhat higher for Nordic countries (0.2%) and CEECs (0.16%).

- ***Pensions play the most prominent role among social transfers.*** On average a one-per cent increase of pensions reduces inequality by around 0.11%. Pensions tend to play a more important role in the Nordic countries (0.16%) and the EU-15 (0.15%) than in the CEEC (0.09%). ([99])

- ***Education and family/children allowances have a relatively small impact on reducing inequality***. A one-per cent increase of these allowances appears to reduce inequality by around 0.05% in the EU-28, with a somewhat higher average impact in the Nordic countries (0.08%) and CEECs (0.06%).

- ***Survivor, sickness and disability benefits tend to have a relatively small effect on inequality***. A one-per cent increase of these items reduces inequality by around 0.04% in the EU-28 on average. The Gini elasticities are slightly higher for the EU-15 (0.05%) and Nordic countries (0.05%).

- ***Unemployment benefits have a relatively small effect on inequality.*** A one-per cent increase reduces inequality by around 0.02% in the EU-28 on average. The Gini elasticity is significantly higher in the Nordic countries (0.07%). ([100])

- ***Social exclusion and housing allowances appear to have the smallest impact in mitigating inequality among the items considered***. A one-per cent increase reduces inequality by around 0.02% (EU-28) and up to 0.03% (Nordic countries).

The Gini elasticities can be decomposed in three components (Table III.3.2; for background information on the calculation of the Gini elasticities see Annex III.2): ([101])

- ***First, the size of the tax or benefit item with respect to total income (S).*** The sub-component *S* measures the share of the tax or benefit item with respect to total income, therefore potentially ranging from 0 (the tax or benefit item is zero) to 1 (the tax or benefit item represents 100% of household's income). ([102]) If the share of income covered by the tax or benefit item is large, that item can

([98]) This paragraph refers to averages for the period ranging from 2004 to 2014.

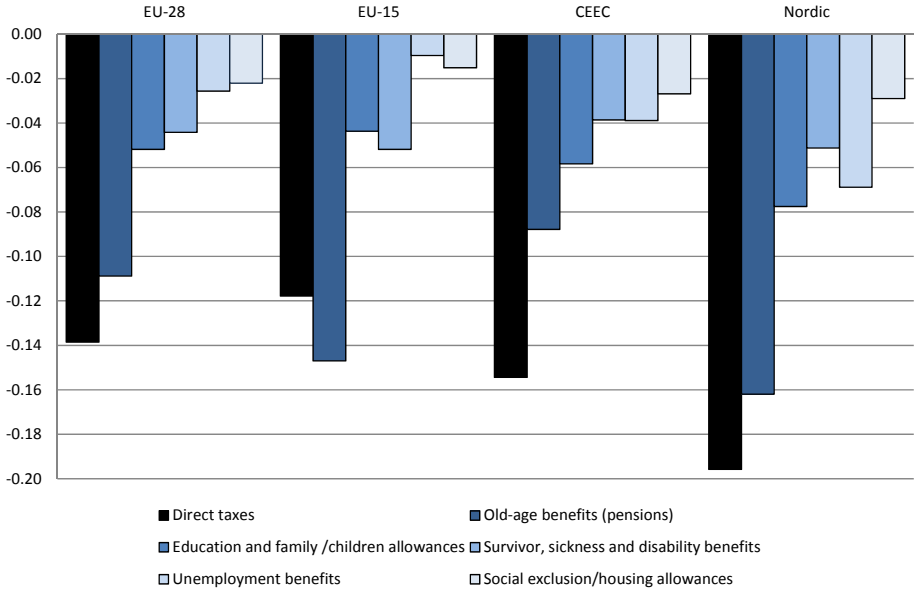
([99]) The role of pensions should, however, be interpreted with caution, since a sizeable part of the pension payments has not a purely redistributive motive, but is linked to the pension contribution payed over the working life (insurance motive).

([100]) Note that the key objective of unemployment benefits is not necessarily to reduce inequality, but to insure against job loss.

([101]) In the following the findings of the decomposition are shown for the EU average (for country-specific results see Annex III.2 Table III.A2.2).

([102]) To allow for an easy comparison across the tax and benefit items, total income is expressed here as the sum of total transfers received plus direct taxes paid, i.e. direct taxes are considered with a positive entry on income. Market income is excluded, since the focus of this part lies on government redistribution.

Graph III.3.7: **Impact of sub-components of the tax and benefit system on income inequality (Gini elasticities in per cent, average 2004–2014)**



Note: The graph shows the effect of key sub-components of the tax and benefit system on the Gini index over the period 2004 to 2014 using so-called Gini elasticities (for a description see Box III.3.1). Country averages are calculated based on unweighted country averages. The elasticities measure the impact of a marginal increase in the tax or benefit item on inequality of disposable income, holding income from other sources constant. Direct taxes include social security contributions from the employees. Data on taxes and social security contributions are missing for the following EU-SILC samples: EL (2004, 2005, 2006), ES (2004, 2005), IT (2004, 2005, 2006), LV (2005, 2006), PT (2004, 2005, 2006). Reading example: A one-per cent increase of direct taxes reduces the Gini index for the EU-28 average by around 0.14% over the period 2004 to 2014.
Source: Author's calculations using EU-SILC.

potentially (but not necessarily) have a large impact on inequality. In the EU-28 on average direct taxes (46%) followed by pensions (34%) represent the most important income sources of the tax and benefit system (Table III.3.2).

Table III.3.2: **Decomposition of Gini elasticities (EU-28, average 2004-2014)**

Source	Gini elasticity	Contributions		
		S	G	R
Direct taxes	-0.14	0.46	0.55	-0.81
Pensions	-0.12	0.34	0.79	0.14
Education, family, children	-0.05	0.07	0.74	-0.12
Survivor, sickness and disability	-0.04	0.08	0.89	-0.01
Unemployment benefits	-0.02	0.04	0.94	-0.04
Social exclusion, housing	-0.02	0.01	0.95	-0.45

Note: This table shows the decomposition of the Gini elasticity in three components S, G and R based on unweighted averages of 28 EU Member States (see Annex III.2 for further information). Since the focus is here on government redistribution, the market income is not considered here as and income source. Total income (S) is expressed here as a share of total transfers plus the absolute value of taxes, excluding market income.
Source: Author's calculations based on EU-SILC.

Significantly less is spent for survivor, sickness and disability benefits (8%), education, family and children allowances (7%), unemployment benefits (4%) and social exclusion and housing benefits (1%).

- ***Second, the distribution of the tax or benefit item across households (G)***. The sub-component *G* measures the distribution of the specific tax or benefit item across households in the form of the Gini index assuming that the specific tax or benefit item is the sole income source. G ranges from 0 (perfect equality, i.e. the benefit received/tax paid is the same for every household) to 1 (maximal inequality, i.e. the benefit received/tax paid is concentrated on only one household). A benefit item, which is totally equally distributed across individuals (G=0), does not redistribute cash across individuals and thus does not influence inequality, irrespective of its magnitude. The findings show that benefits linked to social exclusion and housing, unemployment benefits, but also survivor, sickness and disability benefits are the most unequally distributed. Pensions and education, family/children allowances are less unequally distributed. The least unequally distributed item is direct taxes.

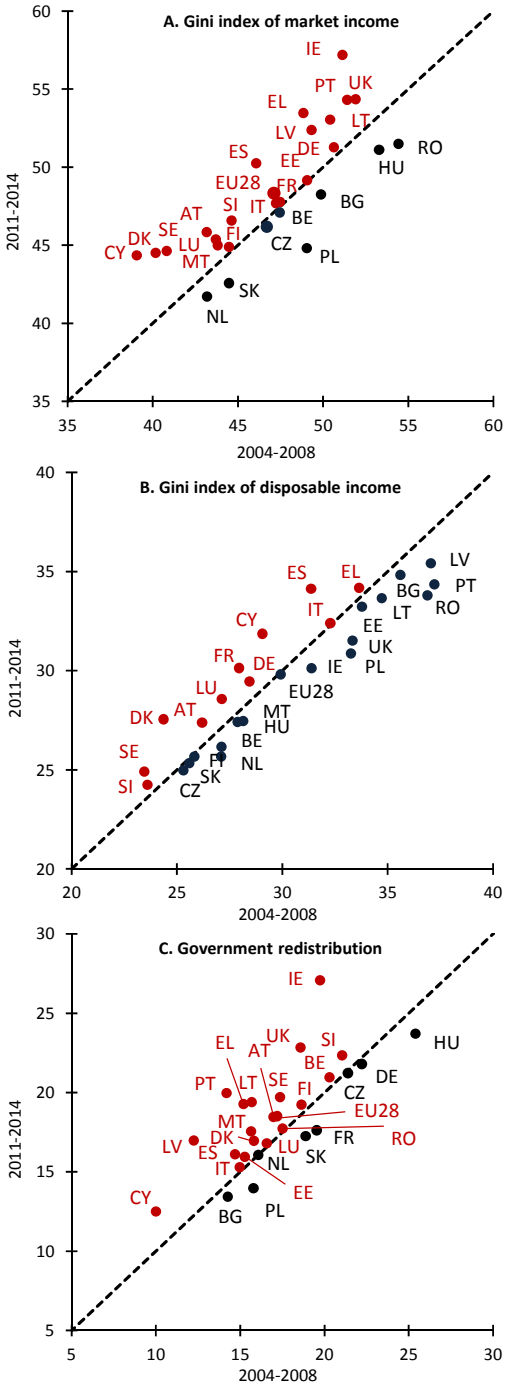
- ***Third, the direction of the tax or benefit item on inequality (R).*** The sub-component *R* shows whether the benefit or tax decreases inequality by targeting the top of the income distribution (R is positive and large) or decreases inequality by targeting the low-income households (R is negative or close to 0). Our findings show that the tax and benefit items considered all tend to reduce income inequality, but with a different degree. Direct taxes and benefits linked to social exclusions and housing seem to have the most important impact, i.e. are those items redistribute most towards the low-income households.

In brief, the redistributive impact of the tax or benefit item depends not only on the size, but also on how much it is targeted to the different income deciles. Pensions have a large elasticity due to the fact that total pension payments are pretty large, but they tend to reach also the medium- and high-income households. On the other hand, benefits for education, family and children are much smaller, but they tend to be targeted to the poor.

3.1.2. Trends since the Great Recession ([103])

Market income inequality has increased in 19 and declined in 8 Member States since the Great Recession (see first panel of Graph III.3.8). The Gini index of market income increased significantly (by at least 4 percentage points) in the post- compared with the pre-Great Recession period in Ireland, Cyprus, Greece, Denmark and Spain. By contrast, most Central Eastern European countries, but also the Netherlands exhibited a reduction in the Gini indices of market income. For the remaining EU Member States, the Gini remained relatively stable between the pre- and post-crisis period.

Graph III.3.8: **Inequality of market and disposable income before and after the Great Recession**



Note: This graph compares the Gini index of market income (left panel) and disposable income (right side) before (average 2004-2008) and after (2011-2014) the Great Recession. Countries above (below) the 45 degrees' line experienced an increase (a decrease) in the Gini coefficient compared to the level before the Great Recession and they are highlighted in red (black).
Source: Author's calculations based on EU-SILC.

([103]) We follow the literature in describing the global economic and financial crisis, which originated in the US housing sector at the end of 2007, as the "Great Recession" (e.g. Mian and Sufi, 2010). To assess how inequality evolved in the aftermath of the Great Recession, we compare the average Gini index of market and disposable income in the period before (average 2004-08) and after (average 2011-14) the Great Recession. Croatia is missing in this section due to lack of data for the period before the Great Recession.

Disposable income inequality has increased in only 11 and declined in 16 Member States since the Great Recession (see second panel of Graph III.3.8). The 16 Member States showing a reduction of inequality include a diverse mix, such as those Member States with lower market inequality (see paragraph above), but also the United Kingdom, Ireland, Finland, Portugal and Latvia.

Government redistribution increased in 19 and declined in only 8 Member States following the Great Recession (Graph III.3.8, III.3.9). Redistribution increased not only in Member States heavily hit by the crisis (IE, PT, EL, CY, ES, SI, IT), but also in several Nordic (UK, DK, FI) and in the Baltic (LV, LT, EE) countries. In several Member States, the additional redistribution more than offset the increase in market inequality, leading to lower inequality in disposable income (e.g. IE, PT, LV, UK, LT, MT, EE) (Graph III.3.9). In other Member States (such as EL, CY, SE, AT, ES, SI, DK, LU) the redistribution has only partially offset the increase in market inequality, resulting in a rise in disposable inequality (Graph III.3.9). France and Germany witnessed over the period both a rising market inequality and a decreasing redistribution through the tax and benefit system, amplifying disposable income inequality.

The high-income households bear a significant part of the adjustment burden following the Great Recession (Graph III.3.10). In 14 Member States net transfers, i.e. social transfers net of direct taxes, of high-income households declined following the Great Recession (in particular in EL, ES, IT, LV, PT). ([104]) This reflected in particular higher taxes and social security contributions for the high-income households. The low- and frequently also the median-income households, in contrast, appear to have benefitted more from government redistribution through an increase in net transfers. The increase mainly results from higher unemployment benefits, while increases in taxes affected them to a lesser extent than high-income households due to their smaller share of tax payments in disposable income. ([105]) This mitigated the adjustment burden of the low- and middle-income households, especially in Member States severely hit by the crisis. ([106])

It is difficult to disentangle the redistributive effects of policy measures from changes in the economic and demographic conditions. De Agostini et al. (2016) try to isolate the impact of policy measures (e.g. changes in the tax or benefit system) from changes in the population structure, i.e. the economic and demographic situation (e.g. more/less persons eligible for unemployment benefits or more retired persons) using EUROMOD simulations during the period 2008–14. ([107]) The authors distinguish between three sets of countries: (i) countries with both implemented policy measures (more progressive policies) and changes in the population structure ([108]), notably in some crisis-hit Member States (EL, CY, ES, IT, SI, PT); (ii) countries which mostly focused on policy measures (notably AT, DK, LU, SE) and (iii) Member States which showed mainly changes in the population structure (e.g. IE, UK and some catching-up Member States). In addition, they find that most Member States implemented policy measures which increased progressivity in the first phase of the crisis (2008-11), whereas they focused more on regressive policy measures in the second phase of the crisis (2011-14).

([104]) The sharp decrease in net transfers for the top decile ranges from 20pps in Spain and Latvia to at least 40pps in Greece, Portugal and Italy.

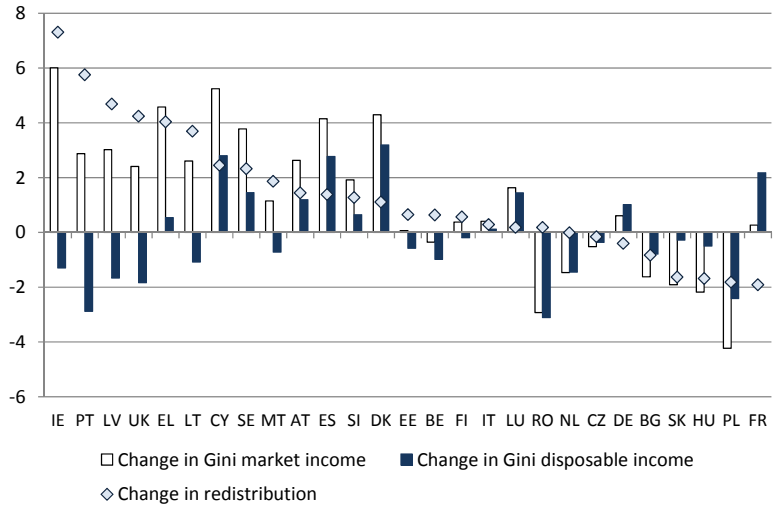
([105]) Further analysis is needed to find out if the increase in unemployment benefit expenditure is due to changes in the generosity of unemployment benefits (policy change), or due to an increase in overall unemployment benefit expenditure (automatic stabilisation, no policy change).

([106]) For instance, the share of net transfers in disposable income drops by around 8pps in Spain, Italy and Latvia, by 14pps in Portugal and 21pps in Greece.

([107]) Different alternative indicators have been used to uprate income components and build a counterfactual of what would have occurred in case of no policy changes (notably market-income index (MII) and consumer price index (CPI)). The findings reported here refer to the use of the MII, but they do not change qualitatively when considering the CPI instead (see De Agostini, et al., 2016). For a similar exercise see Bargain et al. (2017), for an overview article see Figari et al. (2015).

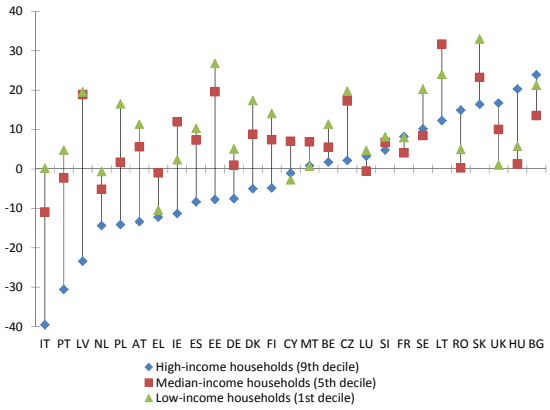
([108]) The change in population structure indicates the combined effect of demographic changes (e.g. more or fewer retired persons, or more or fewer new-borns) and changes induced by the economic situation (e.g. more or fewer unemployed).

Graph III.3.9: **Changes in income inequality and redistribution since the Great Recession**



Note: This graph depicts the change of income inequality (of disposable and market income, in per cent) and redistribution through the tax and benefit systems in the period before (average 2004-08) and after (average 2011-14) the Great Recession. Positive (negative) values indicate that inequality/ redistribution increased (decreased) in the post-crisis compared with the pre-crisis period.
Source: Author's calculations based on EU-SILC.

Graph III.3.10: **Changes in net transfers following the Great Recession (in per cent)**



Note: This graph depicts the change in net transfers (i.e. social transfers net of taxes) associated with the redistribution through the tax and benefit systems in the period after (average 2011-14) compared to before (average 2004-08) the Great Recession. The changes are normalised by the median disposable income before (average 2004-08) the Great Recession. Positive (negative) values suggest that the associated income deciles experienced lower (higher) net transfers in the post-crisis compared with the pre-crisis period, implying an increased (reduced) contribution to the welfare system. There should be caution in interpreting the graph, in particular since (i) a given income decile may not consist of the same households before and after the Great Recession, and (ii) the analysis is restricted to three income deciles only.
Reading example: In Italy, the difference between the market and disposable income (i.e. the net transfers) for the high-income households decreased in the period after the Great Recession by almost 40% of the disposable income of the high-income households before the crisis.
Source: Author's calculations based on EU-SILC.

3.2. TOTAL EFFECTS OF FISCAL POLICY ON INEQUALITY: A REGRESSION ANALYSIS

This section analyses the role of fiscal policy on disposable income inequality using a panel regression model, complementing the previous analysis mainly by two dimensions:

- **First, the regression approach allows analysing the *total*, i.e. direct and indirect, effects of fiscal policy on income inequality**. Section III.3.1. focuses on the direct effects of the tax and benefit systems on income inequality. It does, however, not capture the potential indirect effects resulting from changes in the behavioural responses or macroeconomic feedback effects. ([109]) The regression framework tries to identify the impact from fiscal policy instruments by controlling for

([109]) For instance, an increase in unemployment benefits has a direct inequality-mitigating effect by giving cash to households with otherwise zero earnings. At the same time, the literature suggests that unemployment benefits can weaken work incentives, increase unemployment and lower growth, which, in turn, can potentially increase inequality (indirect effect) (Conesa and Krueger 2006). Similarly, higher taxes for high-income households have a direct inequality-reducing effect. However, insights from the literature suggest that tax hikes can be harmful for growth and therefore potentially increase inequality (indirect effect) (Heathcote et al., 2017).

other potential determinants of inequality (such as unemployment, budget constraints), therefore analysing the total effects.

- Second, the panel framework makes it possible to assess the impact of fiscal policy on income inequality over a longer time horizon. The analysis in the previous section is based on household data, which is only available for the years 2004 to 2014. Using a panel framework enables us to extend the time horizon to the period from 1980 to 2014. This is meaningful, since income inequality tends to be particularly influenced by medium- to long-term factors (Förster and Tóth, 2015). For instance, the effect from technological changes typically only slowly materialises and therefore affects the income distribution over the medium term.

3.2.1. Estimation strategy

The key objective of the regression approach is to explain variations of the Gini index of disposable income. That variable is therefore used as the dependant variable in the regression design. The income inequality data come from the Standardized World Income Inequality Database (SWIID), which provides comparable data on income inequality for a large country sample derived from surveys available for cross-national research. ([110]) Unlike other inequality databases, it includes Gini inequality indices for income inequality before and after taxes and benefits.

The key (independent) variables we want to test are fiscal policy indicators, which measure public spending by function of government. We rely on the OECD Public Finance Dataset, which provides comprehensive, cross-country comparable data on government spending and revenues. ([111]) The breakdown of expenditure items is based on the national accounts classification of the functions of government (COFOG). That definition of fiscal elements is therefore broader than the split used in Section III.3.1, which focuses exclusively on elements of the tax and benefit system. The dataset includes eleven expenditure categories, namely: education, health, other wages and intermediate consumption, old-age and survivor pensions, sickness and disability, unemployment benefits, family and children, subsidies, investment, other primary expenditure, property income paid (incl. interest payments). The same dataset also includes indicators for revenue items, such as revenues from personal income tax.

To isolate the impact from the fiscal policy indicators from other potential channels influencing inequality, we control for a wide range of variables in line with the literature, i.e.: ([112])

- *Inequality*: lagged Gini index of disposable income to control for the persistency in inequality; contemporaneous Gini index of market income to rule out the channel of market inequality;
- *Macroeconomic conditions*: ([113]) real GDP per capita, real GDP growth rate;
- *Budget constraint*: ([114]) primary balance of the general government;
- *Labour market conditions*: ([115]) unemployment rate, share of part-time workers, flexibility of labour market institutions;
- *Demographic factors*: persons above 65 years in per cent of total population;
- *Educational attainment*: ([116]) number of school years;
- *Globalisation and trade*: ([117]) export and imports;
- *Technological changes*: ([118]) value added of high-and medium technology sectors;
- *Political process*: ([119]) partisanship, election year.

The drivers of income inequality are investigated with a dynamic panel data approach. The analysis focuses on up to 28 Member States (*i*) and 8 periods of five-year

([110]) Solt (2016).
([111]) Bloch et al. (2016).
([112]) For a comprehensive summary of the main drivers of inequality see Förster and Tóth (2015).
([113]) Traditional papers are Kuznets (1955) and Barro (2000).
([114]) See Agnello and Sousa (2014) and Ball et al. (2013).
([115]) Checchi and Garcia-Penalosa (2008).
([116]) De Gregorio and Lee (2002); Sylwester (2002).
([117]) Roine et al. (2009); Grossman and Helpman (2016); Dreher (2006).
([118]) Chusseau et al. (2008).
([119]) Alesina and Perotti (1996); Alesina and Rodrik (1994); Mohl and Pamp (2009).

averages between 1980 and 2014 (t) using the following dynamic panel specification: ([120])

$$\ln Gini\ DI_{i,t} = \beta_1 \ln Gini\ DI_{i,t-1} + \beta_2 \ln Gini\ MI_{i,t} + \beta_3 \ln X_{i,t-1} + \beta_4 \ln fiscal\ variables_{i,t-1} + \gamma_t + \theta_i + u_{i,t}$$

where the Gini index of disposable income (*Gini DI*) is regressed on the lagged Gini index of disposable income to take into account the persistence of inequality. We control for the contemporaneous Gini of market income (*Gini MI*) to isolate the impact from disposable income. We do not, however, control for the lagged Gini of market income, since our regression results aim at capturing the indirect effects, which tend to affect market and disposable income over the medium-term (see Chapter III.1, Graph III.1.1). The specification also includes a set of control variables in line with the literature review, which are summarised in vector *X*. The key focus of the analyses lies on the disaggregated fiscal variables, which measure fiscal policy by function of government and are expressed in per cent of GDP. The dynamic panel specification set-up allows assessing short- (ST and long-term (LT) effects of the fiscal variables on income inequality, i.e. $\frac{\partial \ln Gini\ DI}{\partial \ln fiscal\ var.}\Big|^{ST} = \beta_4$; $\frac{\partial \ln Gini\ DI}{\partial \ln fiscal\ var.}\Big|^{LT} = \frac{\beta_4}{(1-\beta_1)}$. We also control for time- (γ) and country-fixed effects (θ) and include an error term (u) ([121]). To simplify the interpretation of the estimated coefficients all variables are logged ([122]). We use 5-year averages to control for business cycle effects and to put an emphasis on longer-term drivers. ([123])

3.2.2. Main results

At first sight, there is an inverse relationship between several fiscal expenditure sub-components and income inequality (Graph III.3.11). That inverse correlation means that an increase in the fiscal expenditure item is associated with a decline in income inequality. The relationship seems to be relatively strong for family and children allowances, expenditure of sickness and disability (with R-squared coefficients of around 0.4) and weaker for health expenditure and unemployment benefits (with R-squared coefficients of around 0.2). There is no clear relationship between inequality and investment and pension spending.

The empirical analysis points to a significant impact of several control variables on inequality. ([124]) The results of the baseline specifications point to a rather strong persistence of income inequality as shown by the significant lagged dependent variable (Table III.3.3). ([125]) The contemporaneous market inequality appears to have a positive and significant impact on inequality. In addition, an increase in real GDP per capita and improvements in the educational attainment tend to reduce inequality. Finally, improving the fiscal situation also tends to reduce inequality, although it is not significant in all specifications used. No clear-cut results can be found regarding the impact of unemployment, ageing or technological change as well as for the role of political-economy factors on income inequality.

Some fiscal expenditure variables have had an inequality-mitigating total effect. In particular, an increase in sickness and disability as well as in family and children expenditure seem to be effective measures in reducing income inequality in the EU-28 on average over the period 1980 to 2014 (Table III.3.4). An increase in sickness and disability benefits by 10% decreases the Gini index of disposable income by around 0.4% in the short-run and by slightly above 1% in the long-term effects. The findings are robust to changes of the variables included in the baseline (see robustness checks shown in Table III.A2.5).

([120]) For a similar specification see: Barro (2000); Berg and Nilsson (2010) and Woo et al. (2013).

([121]) The summary statistics (Table III.A2.3) and correlation matrix (Table III.A2.4) of the variables used can be found in Annex III.2.

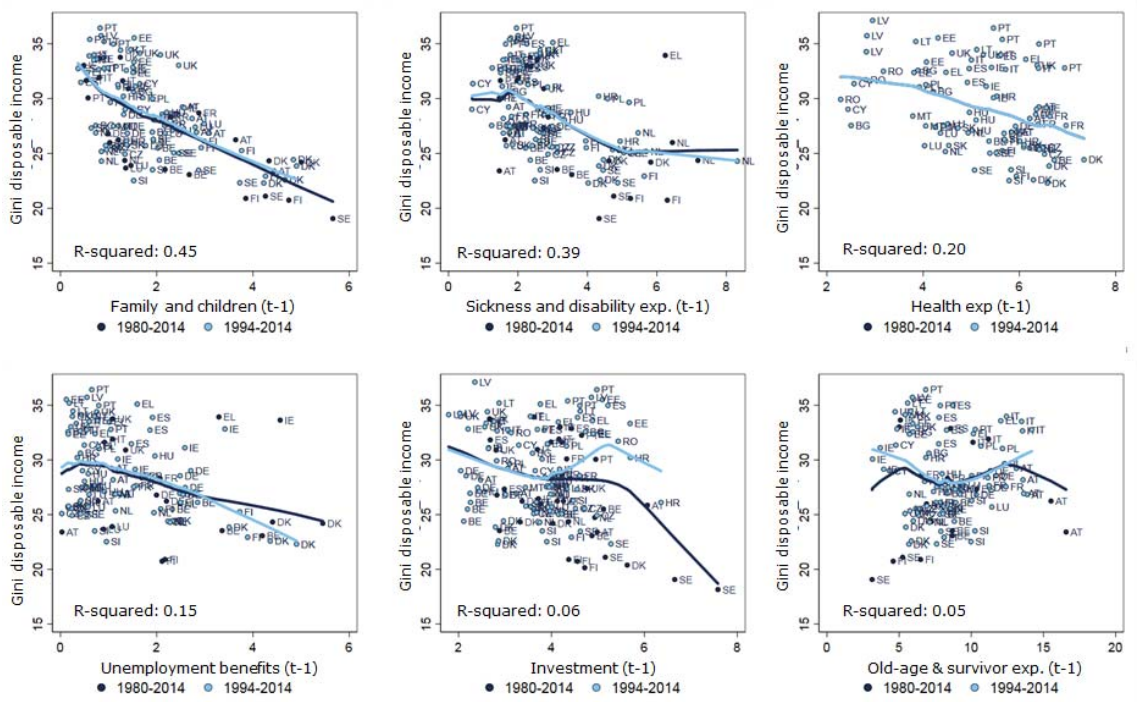
([122]) For variables which can be negative or zero, the value is transformed by adding 10 before taking the log.

([123]) For a similar specification see: Barro (2000); Berg and Nilsson (2010) and Woo et al. (2013).

([124]) The regression strategy is conducted in two steps. In a first step, the baseline specification is derived using the main independent variables identified in the literature. In a second step, the baseline regression is augmented by adding the disaggregated fiscal variables by function of government. In terms of the estimators, we start with a simple fixed effects specification, but also use GMM estimators to control for a potential endogeneity bias.

([125]) More independent variables have been tested, but are not shown since they turned out to be not significant. These include, inter alia, indicators for the labour and product market legislation (measured with OECD indicators), effective corporate tax rate, personal income tax.

Graph III.3.11: **Relationship between inequality and disaggregated fiscal policy items (EU, 1980-2014)**



Note: The graph shows simple correlations between the income inequality measured as the Gini index of disposable income (y-axes) and the main fiscal expenditure items by function of government in per cent of GDP (x-axes) using 5-year averages. The sample covers 28 Member States, which are highlighted in light blue (period since 1995) and dark blue (1980 until 1995). The fit is illustrated using a locally weighted scatterplot (non-parametric regression), which has the main advantage of not requiring to specify a global functional form to fit a model. The fit is calculated for two periods, namely 1980-2014 (dark blue line) and 1995-2014 (light blue line).
Source: Author's calculations.

In addition, expenditure on education and health appear significant in almost all specifications. Education expenditure is found to have the biggest impact across the fiscal sub-elements considered. An increase of education spending by 10% can decrease the Gini index of disposable income by more than 1% in the short-run and close to 2% in the long-run. The impact from a rise in health expenditure is expected to be somewhat smaller. The remaining fiscal expenditure items turn out to be not statistically significant. In terms of the robustness of the results, adding those fiscal sub-elements to the baseline specification does not alter substantially the findings for the key control variables reported in the previous paragraph.

Overall, the findings of the regression analysis show that indirect effects can weaken the impact of fiscal policy on inequality. As explained above, a key advantage of the panel regression framework is to account for the behavioural and macroeconomic feedback effects of the fiscal expenditure items. These indirect effects can occur if the tax and benefit items weaken incentives to work or to invest in skills or if higher debt needed to finance a tax or benefit item weighs on growth. The findings reported in the regression table reveal that these indirect effects seem to (partly) offset the positive direct impact of some fiscal items on inequality. As a result, not all fiscal expenditure items are found to have a significant impact on inequality reduction for the EU-28 on average over the medium-term. This may be also explained by the fact that some fiscal sub-categories (such as pensions or unemployment benefits) may be spent more for insurance than for redistributive purposes.

Table III.3.3: **Regression results – baseline specification**

	(1) FE	(2) First-Diff GMM	(3) Sys-GMM	(4) Sys-GMM	(5) Sys-GMM	(6) Sys-GMM	(7) Sys-GMM	(8) Sys-GMM	(9) Sys-GMM	(10) Sys-GMM	(11) Sys-GMM	(12) Sys-GMM	(13) Sys-GMM
ln gini (t-1)	0.294***	0.362**	0.258**	0.325**	0.597***	0.631***	0.693***	0.673***	0.603***	0.711***	0.588***	0.666***	0.310*
	(4.999)	(2.115)	(1.981)	(2.372)	(3.486)	(5.362)	(3.885)	(5.361)	(4.327)	(4.077)	(2.639)	(4.654)	(1.734)
ln gini market income (t)	0.477***	0.038	0.187	0.120	0.292	0.376**	0.355*	0.479**	-0.045	0.337**	0.494**	0.360**	0.775***
	(4.505)	(0.126)	(0.721)	(0.477)	(0.753)	(2.334)	(1.700)	(2.096)	(-0.170)	(1.998)	(2.340)	(2.030)	(6.966)
ln real GDP pc (t-1)	-0.077	-0.044*	-0.040*	-0.040	-0.040**	-0.033***	-0.034***	-0.038***	-0.056***	-0.038**	-0.036	-0.035***	-0.070***
	(-1.045)	(-1.884)	(-1.801)	(-0.698)	(-2.080)	(-3.232)	(-2.625)	(-3.506)	(-2.791)	(-2.480)	(-0.975)	(-2.825)	(-4.293)
ln real GDP pc squared (t-1)				-0.025									
				(-0.087)									
real GDP growth (t)					-0.003								
					(-0.824)								
ln govt. headline balance (t-1)						-0.349*	-0.371**	-0.500	-0.094	-0.108	-0.234	-0.389**	-0.323
						(-1.897)	(-2.118)	(-1.261)	(-0.249)	(-1.161)	(-1.410)	(-2.315)	(-1.430)
ln unemp. rate (t-1)							0.016	0.022	0.030*	0.011	0.019*	0.011	0.003
							(1.675)	(0.971)	(1.822)	(1.339)	(1.798)	(1.513)	(1.129)
ln openness (t-1)								-0.013					
								(-0.795)					
ln part-time work (t-1)									0.031				
									(1.640)				
ln share pop > 65 (t-1)										0.021			
										(0.474)			
ln value added high-medium tech (t-1)											-0.016		
											(-0.670)		
ln govt. left (t-1)												0.024	
												(1.138)	
ln # school years (t-1)													-0.282**
													(-2.325)
# observations	153	153	153	153	153	143	143	143	112	143	76	143	143
# countries	28	28	28	28	28	28	28	28	28	28	23	28	28
Max # of obs per country	8	8	8	8	8	8	8	8	6	8	8	8	8
Min # of obs per country	3	3	3	3	3	2	2	2	2	2	2	2	2
Avg # of obs per country	5,5	5,5	5,5	5,5	5,5	5,1	5,1	5,1	4,0	5,1	3,3	5,1	5,1
AR(1) (p-value)		0,03	0,04	0,04	0.0472	0,04	0,05	0,05	0,01	0,06	0,12	0,05	0,09
AR(2) (p-value)		0,32	0,32	0,34	0.190	0,11	0,14	0,15	0,73	0,12	0,94	0,11	0,90
Hansen (p-value)		0,73	0,73	0,74	0.916	0,92	0,87	0,90	0,92	0,80	0,88	0,90	0,67
# instruments		27	27	31	28	28	29	30	31	33	30	30	30

Note: The sample includes up to 28 Member States covering the period 1980-2014 using 5-year average. Dependent variable is the Gini of disposable income. All estimations include time dummies, which are not shown due to space constraints. Estimation approaches: (1) Fixed effects using heteroskeadasticity-robust Huber-White standard errors (FE); (2) first-step difference GMM estimator (First-Diff GMM); (3) two-step system GMM (SYS-GMM) estimator following Blundell and Bond (1998), controlling for endogeneity of the lagged dependent variable and the real GDP per capita. While both estimators (2) and (3) are consistent, (3) is more asymptotically efficient. Due to the small sample size the set of internal instrumental variables is restricted to up to 4 lags and the matrix of instruments is then "collapsed". The standard errors are corrected following Windmeijer (2005). AR(1,2) and Hansen tests confirm the validity of the GMM specifications. ***, ** and * denote respectively statistical significance at 1, 5 and 10%.
Source: Author's calculations.

While the regression analysis allows for a better understanding of the total, i.e. direct and indirect, effects of fiscal policy on income inequality, some caveats remain:

- First, as for every cross-country panel approach, the results reveal relationships that are valid only on average across countries over the whole time period of investigation. This means that they may not be valid for particular sets of countries or for specific sub-periods. ([126])
- Second, while the use of 5-year averages accounts for the fact that inequality tends to be driven by medium-term changes, it comes with the cost of reducing the number of observations significantly.
- Third, income inequality is a multi-dimensional phenomenon and it remains challenging to control for the full set of potential channels without phasing a problem from multicollinearity.
- Finally, taking account for the timing of the effect of the explanatory variables is difficult. Globalisation, for instance, may well be a significant factor, but it may take some time to affect the income distribution. Furthermore, the delay may not be the same across countries and across factors.

([126]) The recent reforms in several Member States to increase incentive-compatibility of unemployment benefits, may not be fully captured, since the empirical findings only hold on average for the EU for the time period 1980 to 2014.

Table III.3.4: **Regression results – key fiscal policy components**

	(1) Sys-GMM	(2) Sys-GMM	(3) Sys-GMM	(4) Sys-GMM	(5) Sys-GMM	(6) Sys-GMM	(7) Sys-GMM	(8) Sys-GMM	(9) Sys-GMM	(10) Sys-GMM	(11) Sys-GMM	(12) Sys-GMM
ln gini disposable income (t-1)	0.325*	0.386*	0.488***	0.380**	0.385**	0.684***	0.576***	0.484**	0.648***	0.333*	0.424**	0.408*
	(1.686)	(1.847)	(3.462)	(2.394)	(2.245)	(5.066)	(3.031)	(2.301)	(2.577)	(1.910)	(2.530)	(1.789)
ln gini market income (t)	0.603***	0.701***	0.591***	0.540***	0.902***	0.543**	0.603***	0.818***	0.268	0.673***	0.770***	0.783***
	(3.698)	(4.742)	(5.951)	(3.105)	(4.950)	(2.255)	(4.275)	(5.045)	(0.651)	(2.982)	(4.950)	(3.316)
ln real GDP pc (t-1)	-0.073***	-0.069***	-0.061***	-0.048***	-0.101***	-0.020*	-0.038*	-0.046	-0.039**	-0.075***	-0.046**	-0.075***
	(-4.002)	(-4.828)	(-4.519)	(-2.853)	(-3.084)	(-1.869)	(-1.889)	(-1.236)	(-2.018)	(-4.576)	(-2.237)	(-3.303)
ln govt. headline balance (t-1)	0.442	-0.526**	-0.803***	0.115	1.073	-0.457	-0.192	0.409	-0.376*	0.106	0.371	0.314
	(0.711)	(-2.273)	(-2.804)	(0.341)	(1.346)	(-1.046)	(-0.426)	(0.952)	(-1.813)	(0.182)	(0.912)	(0.461)
ln unemp. rate (t-1)	0.006	0.027	0.021	0.013	0.007*	0.023	0.028	0.026	0.024	0.022	0.015	0.031*
	(0.260)	(1.502)	(1.045)	(1.189)	(1.867)	(1.042)	(1.024)	(1.003)	(0.728)	(0.767)	(1.101)	(1.849)
ln openness (t-1)	-0.012	-0.005	-0.018	-0.017	0.017	-0.005	0.001	0.020	-0.016	-0.010	-0.007	-0.003
	(-0.437)	(-0.301)	(-1.422)	(-0.788)	(0.511)	(-0.364)	(0.070)	(1.166)	(-0.404)	(-0.286)	(-0.264)	(-0.094)
ln share pop > 65 (t-1)	0.022	-0.019	-0.032	-0.011	-0.020	0.012	0.024	0.044	-0.018	0.027	-0.013	0.018
	(0.322)	(-0.408)	(-0.731)	(-0.274)	(-0.232)	(0.292)	(0.403)	(0.723)	(-0.221)	(0.292)	(-0.273)	(0.240)
ln # school years (t-1)	-0.245**	-0.307**	-0.235*	-0.259***	-0.152*	-0.052	-0.172*	-0.108	-0.154	-0.250**	-0.165***	-0.212*
	(-2.238)	(-2.464)	(-1.929)	(-2.712)	(-1.863)	(-1.542)	(-1.758)	(-1.264)	(-0.943)	(-2.110)	(-3.041)	(-1.730)
ln education exp. (t-1)		-0.115***										
		(-2.631)										
ln health exp. (t-1)			-0.058									
			(-1.577)									
ln other wages/interm cons. exp. (t-1)				-0.078								
				(-0.992)								
ln old-age & survivor pensions exp. (t-1)					0.067							
					(1.561)							
ln sickenss and disability exp. (t-1)						-0.036**						
						(-2.368)						
ln unemployment benefits exp. (t-1)							-0.011					
							(-0.867)					
ln family and children exp. (t-1)								-0.044*				
								(-1.890)				
ln subsidies exp. (t-1)									-0.009			
									(-0.286)			
ln investment exp. (t-1)										-0.026		
										(-0.743)		
ln other primary exp. (t-1)											-0.033	
											(-0.911)	
ln property income paid exp. (t-1)												0.015
												(0.643)
# observations	143	87	87	77	105	116	106	112	141	140	75	140
# countries	28	28	28	27	27	27	27	27	28	28	27	28
Max # of obs per country	8	4	4	4	6	6	6	6	8	8	4	8
Min # of obs per country	2	2	2	1	1	1	1	1	2	2	1	2
Avg # of obs per country	5,1	3,1	3,1	2,9	3,9	4,3	3,9	4,1	5,0	5,0	2,8	5,0
Short-term effect fiscal item (size)		-0,115	-0,058	-0,078	0,067	-0,036	-0,011	-0,044	-0,009	-0,026	-0,033	0,015
Short-term effect fiscal item (p-value)		0,009	0,115	0,321	0,119	0,018	0,386	0,059	0,775	0,457	0,362	0,520
Long-term effect fiscal item (size)		-0,187	-0,127	-0,125	0,108	-0,115	-0,025	-0,086	-0,026	-0,039	-0,058	0,026
Long-term effect fiscal item (p-value)		0,001	0,142	0,227	0,192	0,016	0,410	0,010	0,747	0,410	0,263	0,517
AR(1) (p-value)	0,08	0,05	0,07	0,06	0,08	0,04	0,08	0,09	0,06	0,10	0,06	0,12
AR(2) (p-value)	0,85	0,30	0,36	0,28	0,75	0,86	0,88	0,61	0,26	0,99	0,30	0,86
Hansen (p-value)	0,96	0,41	0,98	0,91	0,51	0,63	0,94	0,75	0,91	0,96	0,55	0,98
# instruments	38	26	35	32	28	28	37	31	36	39	29	39

Note: The short- and long-term effects report the size and significance level of the fiscal expenditure items, i.e. expenditure for education, health, old-age and survivor etc. For more details on the estimation approach used, see note of Table III.3.3. ***, ** and * denote respectively statistical significance at 1, 5 and 10%.
Source: Author's calculations.

4. FISCAL POLICY AND ECONOMIC FLUCTUATIONS: AN ANALYSIS OF AUTOMATIC STABILISERS ACROSS INCOME GROUPS

This chapter analyses the functioning of the automatic counter-cyclical stabilisation effects of fiscal policy on income, consumption and GDP across income groups in the 28 Member States for 2014. It investigates how the redistributive policies help to stabilise the economy in case of an economic shock to market/gross income (i.e. before taxes and benefits). While redistributive policies, and in particular the tax and benefit systems reviewed in Chapter III.3, aim at reducing inequality, they have also the side effect to help to stabilise the economy following economic shocks via direct income support.

While the stabilisation of the economy over the economic cycle is a key function of fiscal policy, ([127]) **there are typically two ways to conduct counter-cyclical fiscal policy**. First, policy-makers can rely on the *existing*, i.e. *unchanged*, legal provisions of the expenditure and revenue of a country. Most revenue items, in particular a progressive income tax rate, but also a few expenditure items (notably unemployment benefits) are highly correlated with the economic cycle. As a consequence, the government budget automatically worsens in downturns and stabilises the economy unless policy-makers actively counteract that effect. ([128]) That property is labelled "automatic stabilisation". ([129]) Second, policy-makers can implement *ad-hoc*, i.e. *discretionary*, fiscal policy measures to accommodate output fluctuations. ([130])

This chapter analyses the *direct* and *total* effects of the automatic (as opposed to ad-hoc) stabilisers on income and demand. The literature has used two different approaches to analyse the size of automatic stabilisers (Box III.4.1). First, the microeconomic-based approach focuses on the stabilisation properties of the tax and benefit system and their *direct* effect on disposable income and consumption using household data. ([131]) Second, the macroeconomic-inspired approach concentrates on the overall fiscal policy and its *total*, i.e. direct and indirect, impact on disposable income, consumption and GDP, taking into account behavioural responses macroeconomic effects.

The chapter is thus structured in two sections:

- **It first analyses the *direct* automatic stabilisation effects of the tax and benefit system on income and consumption for 2014 using the microsimulation model EUROMOD** (Section III.4.1.). It calculates indicators of automatic stabilisation through the tax and benefit systems with EUROMOD based on household data from the EU statistics on Labour and Income Conditions (EU-SILC) for 28 Member States and Eurostat and the Family Resource Survey for the UK (see Annex III.3 for a description of EUROMOD). In line with the previous literature, the shock is modelled in a stylised way as a 5% proportional shock reducing market income across all households. A key underlying assumption is that the employment status of the individuals will not change. As a consequence, the measured size of automatic stabilisers is likely to be underestimated, since unemployment will probably increase following such a deep shock, resulting in higher expenditure on unemployment benefits. ([132])

([127]) Musgrave (1959).

([128]) For an assessment of this effect in EU Member States during the crisis, see Part III of European Commission (2015).

([129]) Auerbach and Feenberg (2000) define automatic stabilisers as "… those elements of fiscal policy that tend to mitigate output fluctuations without explicit government intervention". The authors describe a progressive income tax as a typical example of an automatic stabiliser. By increasing (reducing) the incidence of tax liabilities on market incomes during booms (recessions), a progressive income tax acts as a smoothing factor on demand with respect to the business cycle.

([130]) There has been an intense discussion on the functioning of discretionary fiscal policy. Some argue that it is an ineffective tool e.g. due to (too) long implementation lags (e.g. Taylor, 2009). Others, in contrast, argue that automatic stabilisers alone are not sufficient to smooth incomes at least in case of a deep economic shock, requiring complemented action from discretionary fiscal policy (e.g. Christiano et al., 2011).

([131]) Musgrave and Miller (1948); Auerbach and Feenberg (2000); Brandolini et al. (2014); Dolls et al. (2012); Dolls et al. (2015) and Feyrer and Sacerdote (2013).

([132]) DiMaggio and Kermani (2016).

Box III.4.1: **Indicators of automatic stabilisers of income and consumption: micro- vs. macro-perspective**

The box describes the indicators used in this chapter to quantify the size of the *automatic* (as opposed to discretionary) stabilisation effects of income and consumption (i.e. demand). It is useful to distinguish between a micro- and macroeconomic perspective on automatic stabilisation.

A. Microeconomic perspective on automatic stabilisation: focus on direct effects (Section III.4.1.)

Automatic stabilisers used in the microeconomic literature aim at identifying the direct effects of the tax and benefit system in cushioning an economic shock. ([1]) This strand of literature typically assumes a certain shock on market income (i.e. before taxes and benefits) and quantifies the direct stabilisation effect of the tax and benefit system on households' disposable income and consumption using a microsimulation model.

Two indicators are calculated in this chapter using the microsimulation model EUROMOD:

The first indicator quantifies the size of the automatic stabilisation of *income* (τ_h^{micro}). It measures the direct cushioning effect of the tax and benefit system on households' disposable income following an exogenous 5% shock, which reduces households' market income under the assumption that all the household members were to experience at once the same income shock. It is therefore defined as the (negative) change in net transfers (i.e. taxes paid (T) minus benefits received (B)) following a shock to market income. The income stabilisation coefficient can be expressed as follows:

$$\tau_h^{micro} = \frac{\Delta(T_h - B_h)}{\Delta Y_h^M} = \frac{\Delta Y_h^M - \Delta Y_h^D}{\Delta Y_h^M} = 1 - \frac{\Delta Y_h^D}{\Delta Y_h^M}$$

where $\Delta Y_h^M (\Delta Y_h^D)$ measure the change of the market (disposable) income of household h before and after the economic shock. The income stabilisation coefficient measures the share of disposable income which is absorbed following a shock to market income due to the tax and benefit system. In absence of a tax and benefit system, the entire amount of a change in market income would affect disposable income and the income stabilisation coefficient (ISC) would be equal to zero per cent. Taxes and benefits, however, reduce the extent to which a shock to market income is transmitted to disposable income. The larger the ISC, the more stable is the household's disposable income following a shock to market income thanks to the shock-absorbing impact from the tax and benefit system. While τ_h^{micro} is defined for each household, country-specific coefficients are calculated as averages of the household-specific ones. ([2]) The income stabilisation coefficients are computed based on the tax and benefit rules for 2014 using 2012 data from the EU-SILC for 28 EU countries and the Family Resource Survey for the UK, which are uprated to 2014 to match the year for which the policy system is analysed. ([3])

Apart from the stabilisation of income, the stabilisation of consumption (i.e. demand) plays an important role for the real economy. Households usually do not cut consumption by the full amount of disposable income reduction, but use part of their savings to compensate for their loss in market income. This (dis-)saving behaviour adds to the income smoothing effect from the tax and benefit system, when

([1]) It goes back to the seminal paper by Pechman (1973) and has been developed in recent years in particular by Knieser and Ziliak (2002), Auerbach (2009) and Dolls et al. (2012).

([2]) While Dolls et al. (2012) report stabilisation coefficients at the country level only, we prefer using household-specific coefficients, since it allows analysing the heterogeneity of the stabilising effect of the tax and benefit system across households. For sensitivity purposes, we also calculate stabilisation coefficients based on the individual level (see Section A3.2 in Annex III.3 for more details). Overall, the findings do not change fundamentally so that this chapter focuses on the indicators derived from the household and country level.

([3]) For each income source, some factors are applied (i.e. consumer price index, average earnings increase, legal variations in benefit amounts, or other specific indexes as appropriate) to bring the income values from the income reference period up to the level of the policy year (see Sutherland and Figari, 2013).

(Continued on the next page)

Box (continued)

considering the impact on consumption. A crucial assumption for the evaluation of the automatic demand stabilisation is therefore how much of the change in disposable income is spent for consumption, which is captured by the marginal propensity to consume. ([4])

Therefore, the second indicator measures the size of the automatic stabilisation of consumption (i.e. demand) (θ_h^{micro}). It measures the cushioning effect of the tax and benefit system on households' consumption following a positive and exogenous 5% shock on households' market income assuming that all the household members were to experience at once the same income shock. The demand stabilisation coefficient can be expressed as follows:

$$\theta_h^{micro} = 1 - \frac{\Delta C_h}{\Delta Y_h^M} = 1 - \frac{\alpha_h * \Delta(Y_h^M - T_h + B_h)}{\Delta Y_h^M} = 1 - \frac{\alpha_h * \Delta Y_h^D}{\Delta Y_h^M} = 1 - \frac{\Delta Y_h^D}{\Delta Y_h^M} + (1 - \alpha_h)\frac{\Delta Y_h^D}{\Delta Y_h^M}$$

where the change in consumption before and after the economic shock (ΔC_h) is computed as the marginal propensity to consume of household h (α_h) multiplied by the change of disposable income (ΔY_h^D). The consumption stabilisation coefficient measures the share of consumption which is absorbed following a shock to market income due to the tax and benefit system and the marginal propensity to consume. The coefficient can be decomposed in two parts: (i) the income stabilisation coefficient plus (ii) the degree of (dis-)saving that smooths the consumption behaviour of the shock transmitted to disposable income. If consumption does not react at all to the shock ($\alpha_h = 0$), the demand stabilisation coefficient reaches its maximum at 100%. Conversely, if consumption reacts fully to the change in market income ($\alpha_h = 1$), the demand stabilisation coefficient is equal to the income stabilisation coefficient. The marginal propensities used for all 28 EU countries are derived from estimates for Italy, taking into account that poorer households tend to consume a higher share of their additional income than richer ones. ([5]) The calculations are therefore only an approximation of the "true" degree of demand stabilisation.

B. Macroeconomic perspective on automatic stabilisation: focus on total effects (Section III.4.2.)

Automatic stabilisers used in the macroeconomic literature try to capture the total, i.e. direct and indirect, effects of fiscal policy in cushioning an economic shock. The design of automatic stabilisers can influence the behaviour of individuals through several channels, e.g. by influencing labour supply and/or capital accumulation. ([6]) Using a macroeconomic general equilibrium model like QUEST makes it possible to capture those behavioural responses and to take into account other constraining factors such as the (inter-temporal) budget constraint to avoid the possibility of Ponzi behaviour. Moreover, using general equilibrium models allows to distinguish between different types of shocks (e.g. temporary vs. permanent or demand- vs. supply-side shocks) and between different types of agents affected by the shocks (e.g. credit-constrained versus non-credit-constrained (Ricardian) agents).

In this chapter the macroeconomic-based automatic stabilisers are computed using the general equilibrium model QUEST. To allow for a meaningful comparison between macro- and micro-perspective, the shock to disposable income generated in QUEST tries to replicate as much as possible the shock on market income under EUROMOD. ([7])

The calculation of automatic stabilisers in macroeconomic models requires the choice of a benchmark scenario, representing a hypothetical situation where automatic stabilisers do not operate. In a macroeconomic equilibrium model, it is necessary to define automatic stabilisers as the difference with respect to a benchmark scenario. ([8]) This benchmark defines what *would* happen to the budget following a

([4]) The marginal propensity to consume is defined as the impact of a marginal change of income on consumption.
([5]) In this chapter the following marginal propensity to consume are assumed: 60% for households belonging to the poorest quintile of the income distribution, 52% (2nd quintile), 46% (3rd quintile), 41% (4th quintile) and 36% for the richest quintile (see Jappelli and Pistaferri, 2014).
([6]) See McKay and Reis (2016).
([7]) See Box III.4.2 for further details.
([8]) See in 't Veld et al. (2013).

(Continued on the next page)

Box (continued)

shock if *automatic stabilisers are absent*. To put it differently, this benchmark depicts a counter-factual scenario, where automatic stabilisers are "switched off". We follow the literature and use here a simple benchmark, assuming that the budget is unchanged *in levels*. ([9]) This assumption allows having a coherent analysis between the micro and macro models. The benchmark implies that a decline in revenues and a possible increase in expenditures caused by a shock are offset by other measures taken by the government. Generally, these measures take the form of lump sum taxes and lump sum benefits, which are considered to be a *neutral* form of taxes and transfer, not distorting the behaviour of the economic agents. While these measures are frequently used in model simulations, they are rarely used in policy-making.

The macro approach used here assesses the impact of automatic stabilisation on income, consumption and GDP with respect to a benchmark scenario, in which the automatic stabilisers do not operate and tax and expenditures are fixed in levels. The stabilisation coefficient can be therefore expressed as:

$$\varphi_c^{macro} = 1 - \frac{\Delta X}{\Delta X_{benc\,hmark}} = 1 - \frac{\Delta X}{\Delta X_{LS}}$$

where X stands for income, consumption or GDP, ΔX measures the change in X induced by the economic shock in the absence of any discretionary policy intervention, while the benchmark is defined as the change in X assuming that the level of public revenue and expenditures is kept constant through the use of non-distortive (i.e. lump sum) taxes and transfers (ΔX_{LS}).

A comparison of the direct effects of automatic stabilisation on income and consumption derived from the micro- and macroeconomic approach is meaningful. At first glance, the comparison between income and demand stabilisation coefficients seems to be not telling, since the denominators under the micro- (ΔY_h^M) and macroeconomic approach (ΔY_{LS}) appear to be different. However, under the assumption that the tax and benefits are constant before and after the shock in monetary terms, the denominators are identical and a meaningful comparison becomes feasible. ([10]) A comparison of the direct automatic stabilisation coefficients on GDP derived from the micro and macro approach is not possible, since this effect cannot be calculated using the micro approach.

([9]) An alternative benchmark used in the literature assumes that the budget would not change as a ratio to GDP (see in 't Veld et al., 2013). It assumes that expenditures are indexed to GDP, which constitutes a rather generous benchmark.

([10]) The change in market income is equal to the change in disposable income in a world in which tax and benefits are constant in monetary terms, as $\Delta Y_{LS}^D = \Delta Y^M - \overline{T_{before} + B_{before}} + \overline{T_{after} - B_{after}} = \Delta Y^M$ as far as tax and benefits before and after the shock are equal due to their lump sum nature. Therefore, the counterfactual used in micro analysis is a pure lump sum world.

- **The chapter then analyses the *total* automatic stabilisation effects of fiscal policy on income, consumption and GDP using the macrosimulation model QUEST** (Section III.4.2.). It analyses the stabilisation properties of fiscal policy at large (as opposed to the focus on the tax and benefit system in the previous section). For that exercise, the macrosimulation model QUEST ([133]) is used, assessing the impact of a shock of similar size than in EUROMOD. That approach captures the total, i.e. direct and indirect, effects, including the behavioural responses of agents and the debt sustainability constraints of the government. As a result, it represents the total effects under the assumption that the economy functions as predicted under a standard new-Keynesian world.

The micro- and macroeconomic approaches are complementary to each other. The micro approach measures the immediate *direct* stabilisation impact on households' income following a large shock, allowing for a high level of granularity. The macro approach complements the micro approach by measuring the *total* effects, i.e. including direct and indirect effects. In

([133]) QUEST is the European Commission's dynamic stochastic general equilibrium model (DSGE) used for the analysis of fiscal and structural reforms (see Ratto et al., 2009 and Coenen et al., 2012).

addition, it enables to distinguish between different types of shocks. ([134]) While the macro approach is therefore more exhaustive in terms of the total economic effects, it does not capture the impact of the income distribution across households. Moreover, the macroeconomic approach requires determining a counterfactual scenario, i.e. a scenario where automatic stabilisers do not operate, ([135]) which is challenging (see Box III.4.1 for more detailed explanation).

4.1. AUTOMATIC STABILISATION OF INCOME AND DEMAND IN THE EU: A MICROECONOMIC PERSPECTIVE ([136])

4.1.1. Automatic stabilisation of income

Automatic income stabilisation is measured as the share of a shock to market income, which is absorbed by a country's tax and benefit system (Box III.4.1). In absence of a tax and benefit system, the entire amount of a change in market income would affect disposable income (i.e. income after tax and benefits) and the income stabilisation coefficient (ISC) would be equal to zero per cent. Taxes and benefits, however, reduce the extent to which a shock to market income is transferred to disposable income. ([137]) The larger the ISC, the more stable is the household's disposable income following a shock to market income thanks to the shock-mitigating impact from the tax and benefit system. Note that the simulations under EUROMOD may underestimate the impact from some social transfers for two main reasons. First, the simulations do operate under the 'no-status-change assumption', which rules out that some households will become eligible for certain benefits following an economic shock to market income. ([138]) Second, if the amount received of a certain benefit item does not change following the shock to market income, this benefit does not contribute to the stabilisation of income. This means that benefits which hardly vary with market income, have a very small impact on automatic stabilisation.

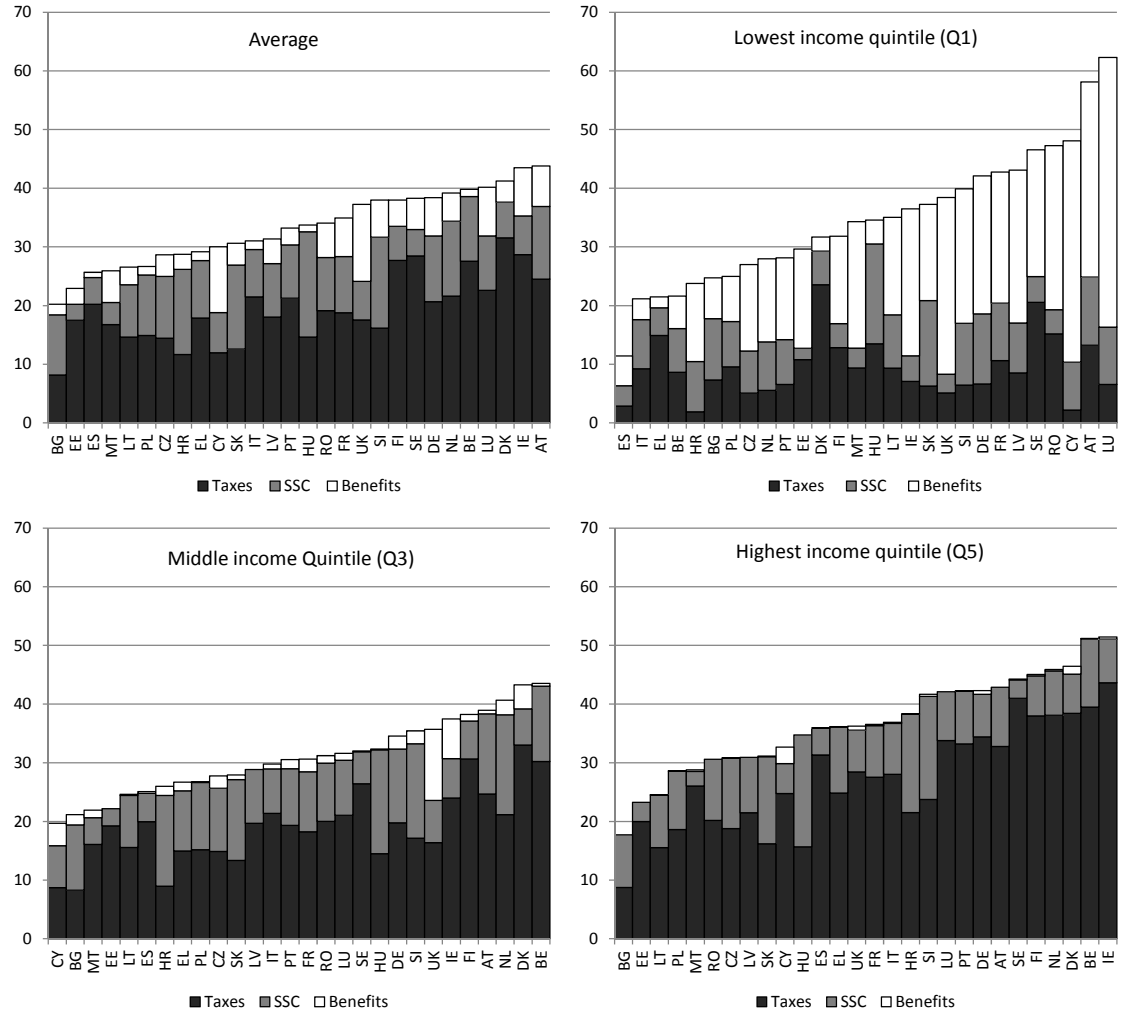
The average degree of automatic income stabilisation in the EU is around 33%, ranging from 20 to 45% across Member States (top-left panel of Graph III.4.1). ([139]) An income stabilisation coefficient of 33% means that 33% of a shock on market income is absorbed by the tax and benefit system. Bulgaria and Estonia experience the lowest average level of income stabilisation with values close to 20%. On the other hand, Denmark and Ireland show the highest income stabilisation coefficients with values close to 45%.

Direct taxes represent on average the main source of income stabilisation, followed by social security contributions and benefits (top-left panel of Graph III.4.1). The comparison does not include pensions, since they hardly vary with market income and in cases where a pensioner's income only consists of pensions (i.e. zero market income), the indicator cannot be computed.

The income stabilisation effects mostly result from social transfers spent for low-income households and from direct taxes paid by high-income households. The importance of transfers and taxes in stabilising income depends on the household income. In most Member States, social benefits play a key role in stabilising the income of households from the poorest quintile of the income distribution (top-right panel of Graph III.4.1). The role of benefits is less pronounced when focusing on households from the third quintile of the income distribution and it is almost negligible when analysing the richest 20% (bottom panels of Graph III.4.1). Taxes, on the contrary, tend to play a relatively larger role in stabilising the income,

([134]) Brunila et al. (2003).
([135]) For a discussion see Box III.4.1 and in 't Veld et al. (2013).
([136]) In this section automatic stabilisation coefficients are based on the household level. Annex III.3 includes robustness tests for coefficients based on the country and individual level. Overall, the results are broadly robust to the indicator used.
([137]) As an example, suppose that a 10% tax is levied on market income and that an exogenous shock causes them to decrease from 100 monetary units to 50 units. Income after tax would decrease from 90 units to 45 units, implying that a reduction of 50 monetary units of market income determines a reduction of 45 units in disposable income. Hence only 90% of the shock is actually transmitted to disposable income, while the ISC would be equal to 10%, which is the shock's share absorbed by the tax system.
([138]) EUROMOD operates under the so-called 'no-status change assumption': households, which have been employed (unemployed) before the shock, will remain employed (unemployed) after the shock.
([139]) The slightly higher income stabilisation coefficients identified by Dolls et al. (2012) can be mainly explained by the different time horizons of the analysis () and the use of different (country- vs. household level).

Graph III.4.1: **Automatic income stabilisation coefficients**



Note: The graph shows the size of automatic income stabilisation by type of fiscal instrument for the 28 Member States on average as well as for selected income quintiles. As highlighted in the main text, the comparison does not include pensions. The country average is calculated as the average across households belonging to the same quintile. Quintile 1/3/5 represent the bottom 20/middle 40-60/top 20% of the income distribution.
Source: Author's simulations based on EUROMOD using EU-SILC data.

the higher the household income (Graph III.4.1). There is no clear pattern of the role of social insurance contributions across income quintiles.

To find out whether the magnitude of income stabilisation depends on the progressivity of the tax and benefit system, the income stabilisation is compared with the stabilisation arising from a flat tax (and benefit) system. ([140]) The income stabilisation coefficient based on the proportional (flat) tax system is labelled the average effective tax rate (AETR). It is defined as the rate which –applied to the aggregate market income in each country– would generate an aggregate level of disposable income equivalent to the one observed. Consequently, the AETR would assure that the net transfers from family to governments would stay at the same level as the actual ones. ([141]) Note that the AETR does not include pensions.

([140]) A means-tested benefit is a payment made to agents whose income and wealth are below specified limits.

([141]) More formally, being $\sum O_i$ the aggregate level of market income, $\sum Y_i$ the aggregate level of disposable income of household i, defined as market income minus taxes paid (T) plus benefits received (B), i.e.:

The tax and benefit systems provide a larger degree of income stabilisation than the equivalent tax and benefit system consisting of a flat tax rate equal to the AETR. The larger the difference between the AETR and income stabilisation coefficients (i.e. the larger the white bars in Graph III.4.2), the larger the progressivity of the tax and benefit system and/or the more important the means-tested allocation of benefits in a given country. The largest differences are observed in Ireland and Cyprus, the smallest in Poland and Greece. In particular, the large progressivity in Cyprus is driven by relatively low incidence of the personal income tax and social insurance contribution on market income and a comparatively large incidence of benefits which tend to reduce the AETR to the value of 8%. In Ireland, a high incidence of benefits reduces the AETR, despite a larger incidence of taxes and social insurance contribution on market incomes than in Cyprus. By contrast, the incidence of benefits on market income is relatively small in Poland and Greece, where the relatively low progressivity of the tax and social insurance contribution system reduces the gap between the income stabilisation coefficient and the AETR.

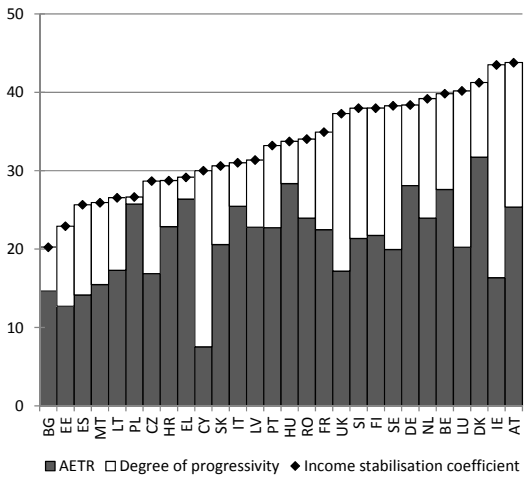
At least three different patterns of income stabilisation across income quintiles can be distinguished (Graph III.A3.2 in Annex III.3).

- **In some Member States the income stabilisation coefficients increase with household income** (e.g. IT, BE, ES). This is due to the progressivity of the tax system which generates higher income stabilisation at the top of the income distribution and comparatively low degree of means-tested benefits for low-income earners.

- **In other Member States, the income stabilisation coefficients increase with household income except for the low-income households, which produce a relatively high level of income stabilisation** (e.g. AT, DE, FR). In those Member States, the progressivity of the tax and benefit system leads to increasing income stabilisation coefficients across income quintiles. In addition, means-tested benefits contribute to a high level of income stabilisation at the bottom of the income distribution. Overall, this results in stabilisation coefficients, which are v- or u-shaped across income quintiles.

- **Finally, in some Member States the income stabilisation coefficients are rather flat across income quintiles** (e.g. HU, PL). In these Member States the tax systems tend to be rather flat, while transfers are relatively small and have little impact on stabilising incomes.

Graph III.4.2: **Progressivity of the tax system and income stabilisation**



Note: The graph compares the degree of automatic income stabilisation (in per cent) of the current tax and benefit system with the degree of stabilisation assuming a hypothetical average effective tax rate (AETR).
Source: Author's simulations based on EUROMOD using EU-SILC data.

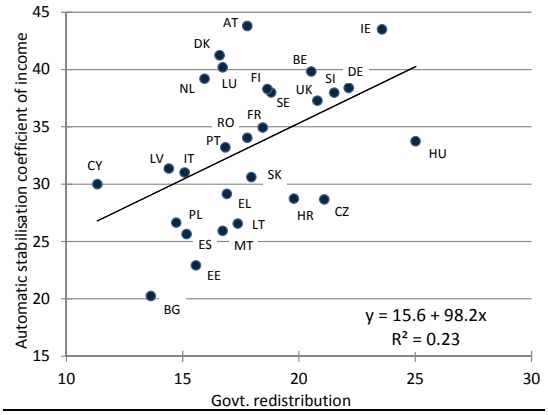
Higher spending for government redistribution is weakly correlated with higher income stabilisation (Graph III.4.3). The higher the government redistribution of a country, the more it tends to stabilise disposable income. There is, however, a high heterogeneity across Member States. As a consequence, a similar level of redistribution through the tax and benefit system can lead to different automatic stabilisation

$$AETR \overset{def}{=} 1 - \frac{\sum Y_i}{\sum O_i} \overset{yields}{\longrightarrow} \sum O_i * (1 - AETR) = \sum Y_i$$
$$\overset{yields}{\longrightarrow} \sum O_i * AETR = -\sum T_i + \sum B_i$$

It should be noted that only households with at least one member receiving market incomes and with no pensioners are included in the AETR calculations. The choice is due to the difficult classification of pensions as government transfers or a return on the contributions paid during the working life. AETR should be interpreted as an average effective tax rate for the working population.

coefficients (see for example AT and LT). On the other hand, countries with similar income stabilisation coefficients can witness different levels of government redistribution (see for instance HU vs. PT).

Graph III.4.3: **Relationship between government redistribution and stabilisation of income**



Note: The graph shows the relationship between government redistribution and the size of automatic stabilisation of income. Government redistribution is measured as the difference between the Gini indices of market and disposable income.
Source: Author's calculations based on the EUROMOD model using data from EU-SILC for the average period 2004 to 2014.

4.1.2. Automatic stabilisation of consumption (demand)

Demand stabilisation coefficients measure the cushioning effect of the tax and benefit system on households' consumption following a shock on market income (for more details see Box III.4.1). Typically, households hit by an economic shock do not cut consumption by the full amount of disposable income reduction, but use part of their savings to compensate for their loss in market income. A crucial assumption for the evaluation of the automatic demand stabilisation is therefore how much of the change in disposable income is spent for consumption, which is captured by the marginal propensity to consume. ([142]) The demand stabilisation coefficient therefore depends on two factors, namely (i) the (dis-)saving behaviour of households and (ii) the change in disposable income, which, in turn, is equal to the change in market income minus net transfers.

Demand stabilisation coefficients are larger than income stabilisation coefficients, since households do not cut consumption by the full amount of disposable income reduction. The demand stabilisation coefficient reaches 100% if consumption does not react at all to the shock to market income, while it is equal to the income stabilisation coefficient if consumption fully reacts to the change in market income.

There is less heterogeneity in consumption stabilisation than in income stabilisation, although significant differences across countries exist (Graph III.4.4). The demand stabilisation coefficient for the EU average is around 70%, ranging from 64% in Bulgaria to 75% in Ireland. A demand stabilisation coefficient of 70% means that 70% of the consumption is absorbed following a shock on market income due to the tax and benefit system and the marginal propensity to consume. The variation across countries is more homogenous when compared to income stabilisation coefficients, which can be explained by the assumptions on the marginal propensity to consume. The tax and benefit systems provide a larger degree of consumption stabilisation than the equivalent tax and benefit system consisting of a flat tax rate equal to the AETR. The larger the difference between the AETR and demand stabilisation coefficients (i.e. the larger the white bars in Graph III.4.2), the larger the progressivity of the current tax and benefit system and/or the more important the means-tested allocation of benefits in a given country.

The demand stabilisation coefficients for high-income households tend to be higher than for low-income households. This can be explained by the lower marginal propensity to consume of richer compared with poorer households. ([143])

Sensitivity analyses suggest that increasing the marginal propensity to consume leads to a reduction in demand stabilisation. Due to the uncertainty regarding the estimates for the marginal propensity to consume, ([144]) we calculate

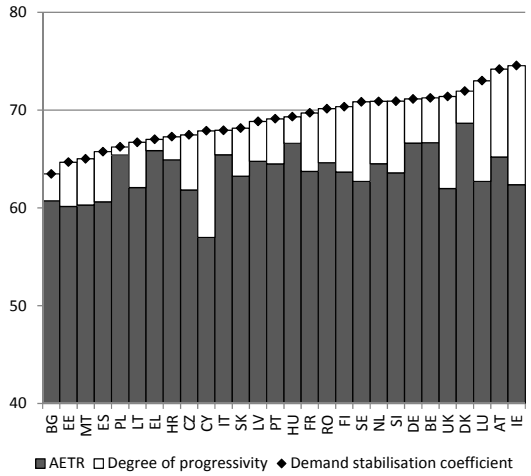
([142]) The marginal propensity to consume is defined as the impact of a marginal change of income on consumption. For more details see Box III.4.1.

([143]) This holds even if it is not the case for the income stabilisation coefficient.

([144]) Marginal propensities to consume cannot be considered constant functions of the individual characteristics, in that they also depend on external economic conditions; typically on the situation in the financial system.

the demand stabilisation coefficients with larger and lower marginal propensities to consume (Graph III.A3.3 in Annex III.3). As a result, the demand stabilisation coefficients decline (increase) if larger (lower) marginal propensities to consume are used, since consumption becomes more (less) responsive to income shocks.

Graph III.4.4: **Automatic demand stabilisation coefficients**



Note: The graph shows the size of the automatic stabilisation coefficients of consumption (i.e. demand). The assumptions on the marginal propensity to consume of the households are taken from Jappelli and Pistaferri (2014) as explained in Box III.4.1.
Source: Author's simulations based on EU-SILC.

4.2. AUTOMATIC STABILISATION OF INCOME, DEMAND AND GDP IN THE EU: A MACROECONOMIC PERSPECTIVE

This section complements the analysis of the direct automatic stabilisation by assessing their total effect for Italy using the macro-simulation model QUEST. It takes into account the behavioural responses as well as the macroeconomic feedback effects, such as the government's constraint to achieve sustainable public finances over the medium-term as well as the impact from monetary policy and potential changes of the employment status following a large economic shock. It thus provides the total effects under the assumption that the economy functions as predicted under a standard new-Keynesian model. We focus on Italy mainly for two reasons: First, the used estimates for the marginal propensity to consume are derived based on data for Italy (see Box III.4.1). Second, Italy represents a large Member State with average automatic stabilisation coefficients for income and consumption.

To allow for a meaningful comparison of the stabilisation coefficients, the shock in QUEST is set up to mimic the shock in EUROMOD (Box III.4.2). Both models are designed to generate a 5% shock to market income. In doing so, QUEST, in contrast to EUROMOD, requires assumptions on the type of shock. The simulations shown here combine the effects of temporary shocks to total factor productivity and exports, reflecting a mix of demand and supply shocks. Given the focus on the stabilisation properties of the economic cycle, the analysis looks at the short-term impact and stabilisation properties of the model as represented by the effects in the first year after the shock.

The automatic stabilisation coefficients in QUEST are derived from the comparison between two scenarios: in the first, automatic stabiliser operate, in the second they do not operate (Box III.4.1, Table III.4.1).

- ***Scenario "on": Automatic stabilisers do operate*** (Table III.4.1 first column). This scenario results in a very negative economic environment, yielding a 4.9% decline in market income, which translates to a decline of real GDP by 4.2%. Disposable income reduces by -3.4%. Consumption declines by only 0.5%. This crucially depends on the presence of liquidity-constraint households.

- ***Scenario "off": Automatic stabilisers do not operate*** (Table III.4.1 second column). The benchmark scenario used here assumes that expenditure and taxes are kept constant at their baseline levels. ([145]) Government investment is fixed in real terms, while public sector wages are kept constant in nominal terms and public employment constant in levels. The level of unemployment benefits paid per unemployed is kept fixed in nominal terms, as is the total amount spent on other transfers to households. The cyclical components of tax revenues and the total amount spent on unemployment benefit payments are fully neutralised by offsetting

([145]) This follows in 't Veld et al. (2013).

changes in lump-sum tax and transfers from/to households. Under these assumptions, the impact to the economy is more detrimental than under scenario A, which assumes that the automatic stabilisers operate. GDP is supposed to decline by 4.5%, disposable income by 3.4% and consumption by 1%.

The automatic income stabilisation coefficient derived from QUEST compares with the one derived from EUROMOD (Table III.4.1)**.** According to the QUEST simulations, disposable income is stabilised by 29% given the particular temporary shocks to total factor productivity and exports. This compares to a coefficient of 33% computed using EUROMOD. The slightly lower income stabilisation coefficient under QUEST can be explained by the impact of indirect effects such as behavioural responses and macroeconomic feedback effects. For instance, the tax and benefit system may provide distortive incentives to work which can weigh on growth. In addition, the reaction of monetary policy following a shock is – everything else equal – supposed to be less expansionary in an environment with than without automatic stabilisation from the tax and benefit system.

Table III.4.1: **Degree of smoothing from automatic stabilisers (in %)**

	Stabilisers		Stabilisation coefficients	
	on	off	QUEST	EUROMOD
Market income	-4,9	-5,1		
Disposable income	-3,4	-3,4	29,1	33,3
Consumption	-0,5	-1,0	54,8	69,1
Real GDP	-4,2	-4,5	5,8	NA

Note: The table shows the size of automatic stabilisation of income, consumption and GDP using QUEST (see Box III.4.2 for more information)."on", "off" refer to scenarios in the text.
Source: Author's calculations.

The automatic consumption stabilisation is smaller in QUEST than in EUROMOD. According to the EUROMOD simulations, Italy's tax and benefit system and the marginal propensity to consume automatically stabilise around 70% of consumption following a shock to market income (Graphs III.4.4). This represents the direct effects on consumption smoothing. The total effect of consumption smoothing as measured by QUEST for that particular combination of shocks is around 55%. The reason is related to the presence of distortions as indicated above and to the fact that consumers that are not financially-constrained, already smooth their consumption behaviour contrary to what happens in EUROMOD.

The size of automatic stabilisation of GDP is much smaller than the stabilisation of consumption. Automatic stabilisation of GDP is of the order of 6%, which is much smaller than consumption stabilisation. Such a sizeable difference is related to the type of the shock, which is constructed as a combination of temporary shocks to labour productivity and export demand. Clearly, the automatic cushioning impact of such a shock is limited to employment, wage and engendered consumption effects. The shocks on investments and exports are not cushioned by the tax and benefit system, so that the government's objective to ensure a balanced budget will further reduce automatic demand stabilisation.

In QUEST the type of shock has a large impact on the size of the automatic stabilisers. Shocks that directly affect labour productivity tend to generate a large wage decrease that limits the impact on employment and therefore results in a limited operation of automatic stabilisers. On the other hand, shocks that have a large negative impact on demand (such as external shocks) depress labour demand and generate larger automatic stabilisers for income and consumption. It is important to stress that automatic stabilisers only work with temporary demand and supply shocks. In case of a permanent supply shocks require adjustment to the new equilibrium and automatic stabiliser would only slow down the adjustment process ([146]).

([146]) Buti and Franco (2005).

Box III.4.2: Analysis of automatic stabilisers in QUEST

This box presents the framework for analysing the automatic stabilisers using the macro-simulation model QUEST.

The QUEST simulations require the specification of a benchmark scenario, in which the automatic stabilisers do not operate. The simulations look at the effects of a combination of shocks to the Italian economy in two alternative scenarios: (i) a situation where automatic stabilisers are operating as normal and (ii) a benchmark scenario where automatic stabilisers do not operate, i.e. are switched off. The comparison between the two scenarios provides the total effect of automatic stabilisers. Expenditures and taxes are kept fixed at their baseline level and changes in lump-sum taxes neutralise the cyclical components of the budget.

To allow for a meaningful comparison between the direct effects in QUEST and EUROMOD, the shock used for QUEST is generated to ensure that the different components of income grow proportionally. In particular, workers with the same level of education receive the same wage; they work the same number of hours and therefore receive the same market wage income. Agents that are not liquidity-constrained receive also income from profits (e.g. from financial assets). In order to approximate the proportional shock to the income of agents used in the micro approach, the shock used in QUEST generates a roughly proportional growth in income from wages and profits for a period of 3 to 5 years after the shock hits the economy. This allows a reasonable comparison between the direct effects of automatic stabilisers derived from EUROMOD and QUEST.

The automatic stabilisation in QUEST depends on the type of shock. The simulations combine the effects of temporary shocks to total factor productivity and exports. The two shocks reflect a mix of demand and supply shock, resulting in a very negative economic environment as represented by a 2% temporary decline in total factor productivity and a negative temporary shock to exports of about 2.8%. This yields a 1% decline in aggregate market income in the first benchmark scenario. Given the linearity, we multiply the shock by 5 to mimic the shock designed under EUROMOD.

The findings show that automatic stabilisers can be sizeable. On the one hand, the degree of total smoothing of GDP fluctuations provided by automatic stabilisers after five years is around 10%, as GDP falls by 0.85% in the presence of automatic stabilisers as opposed to 0.90% in the benchmark. On the other hand, while consumption falls, the automatic stabilisers can absorb a sizeable proportion of the negative effect. This is due to the fact that consumption decisions are heavily affected by the tax and transfer system, in particular by the progressivity of labour taxation. The smoothing effect from the presence of automatic stabilisers mostly concerns liquidity-constrained household, as non-liquidity-constrained households can smooth their consumption over their whole life cycle.

The key findings are robust to the use of an alternative benchmark scenario. The findings reported above are based on the assumption that expenditures and taxes are kept fixed at their baseline level. For a robustness check, a second benchmark scenario is used, where expenditure and taxes are kept constant as a share of GDP and automatic stabilisers are switched off. ([1])

Overall, the results reported here should not be generalised, as they are shock-specific. For instance, in 't Veld, et al. (2013) report, for a combination of shocks that captures the impact of the Great Recession, a consumption smoothing of between 62% and 54%. The degree of consumption smoothing can be larger or lower for other type of shocks.

([1]) In 't Veld, et al. (2013).

5. CONCLUSIONS

This part raises three key questions on the impact of fiscal policy on income inequality, which can be answered as follows.

First, three fiscal policy instruments have been identified in the literature as main drivers of fiscal policy on income distribution, namely: (i) the tax and benefit system (i.e. social transfers in cash, direct taxes and social security contributions), (ii) social transfers in kind (such as the provision of education) and (iii) indirect taxes (i.e. mainly consumption taxes such as VAT). While those policy instruments tend to have a positive *direct* effect in reducing income inequality, they can trigger distortive *indirect* effects, which can (partly) offset the inequality-reducing impact.

Second, empirical evidence shows that fiscal policy had a significant impact in mitigating income inequality in the EU. While income inequality was in 2014 higher in almost all EU Member States than in 1980, its increase mainly results from a level shift of inequality in the 1990s. Since 2000, disposable income inequality has remained broadly unchanged in the EU, while inequality of market income slightly increased. The sizeable difference between market and disposable income can be explained by the inequality-mitigating impact from fiscal policy. The size of redistribution in the EU has increased steadily in recent decades, and stands today significantly above other major advanced economies.

Evidence from household data reveals that the tax and benefit systems had a significant *direct* impact in offsetting the rise in market inequality in the EU over 2004-2014. The inequality-mitigating impact from social transfers was larger than from direct taxes. Fiscal consolidation following the Great Recession was to a large extent borne by the upper part of the income distribution.

Evidence from panel regression analysis suggests that only some expenditure items significantly reduced income inequality in the EU on average between 1980 and 2014. This means that the total effect of fiscal policy on reducing inequality is smaller than its direct effect due to the existence of distortive indirect effects. Expenditures in education, health and allowances related to sickness and disability and family and children expenditure are the spending items whose effect in reducing inequality remains in the long run. Thus, a careful design of fiscal policy is key to ensure reduce excessive inequality and prevent distortive indirect effects.

Third, the tax and benefit systems play an important role in *directly* stabilising income and consumption over the economic cycle across income groups in Member States. Evidence from the microsimulation model EUROMOD shows that the degree of income and demand stabilisation is fairly high in the EU, but varies across Member States. Transfers to low-income households have a crucial role in shielding them from the risk of poverty. The more progressive the taxes are (resp. benefits), the larger the size of income stabilisation. Overall, our analysis does not allow deriving an optimal size of automatic stabilisers. ([147]) While an increase in social transfers and/or taxes would indeed lead to higher automatic stabilisers, this would likely increase economic distortions so that the impact on the total stabilisation effect remains unclear. Moreover, while automatic stabilisers help to cushion transitory income shocks, they may delay inevitable adjustment in the presence of permanent shocks. Overall, the findings show the importance of letting automatic stabilisers play freely in bad economic times, without undoing their effect as it may have happened in certain cases during the Great Recession.

The *total* stabilisation effects of fiscal policy are also smaller than its direct stabilisation effect. A positive side effect of the tax and benefit system is to provide stabilisation in income and consumption to households. Those direct cushioning effects are relatively sizeable in the EU, with roughly one third of the income absorbed by the tax and benefit system following a shock to market income. Consumption is even stabilised by half on average due to the tax and benefit system and the marginal propensity to consume. Overall, the total effect of income and demand stabilisation is smaller than its direct effect, as behavioural responses and

([147]) For a recent work on optimal automatic stabilisers see McKay and Reis (2017).

macroeconomic feedback effects can weigh on growth and thereby reduce the degree of stabilisation.

Overall, the chapter makes clear that fiscal policy needs to be carefully designed to balance equity, stabilisation and efficiency considerations, taking into account potentially harmful indirect effects. Recent calls for more government intervention and redistribution come at a time when government redistribution is close to its historical peak, public finances are constrained in many Member States and public debt ratios are close to their historical peak. A fine balancing between fairness considerations and risks for the future is therefore necessary.

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ANNEX 1

Supplement to Chapter III.2.

The following table provides an overview of estimations for an equivalent monetary impact of the provision of public services in terms of redistribution. It shows calculations of a "monetary value" for the delivery of health care, long-term care, education and childcare for the benefiting households. To account for the fact that the receipts of public services like education and healthcare are associated with particular needs, the consumption needs are also adjusted accordingly.

Table III.A1.1: **Equivalent monetary impacts of the provision of public services in terms of redistribution (additional distributive impact of in-kind benefits in 2009)**

Ireland	0,067
Luxembourg	0,062
Portugal	0,062
Spain	0,062
UK	0,061
Sweden	0,056
Denmark	0,055
Netherlands	0,055
France	0,054
Italy	0,052
Belgium	0,051
Estonia	0,049
Austria	0,048
Greece	0,047
Poland	0,046
Finland	0,045
Germany	0,045
Hungary	0,044
Czech Republic	0,043
Slovakia	0,042
Slovenia	0,04

Source: Aaberge et al. (2017).

Indirect taxation: methodology and detailed data

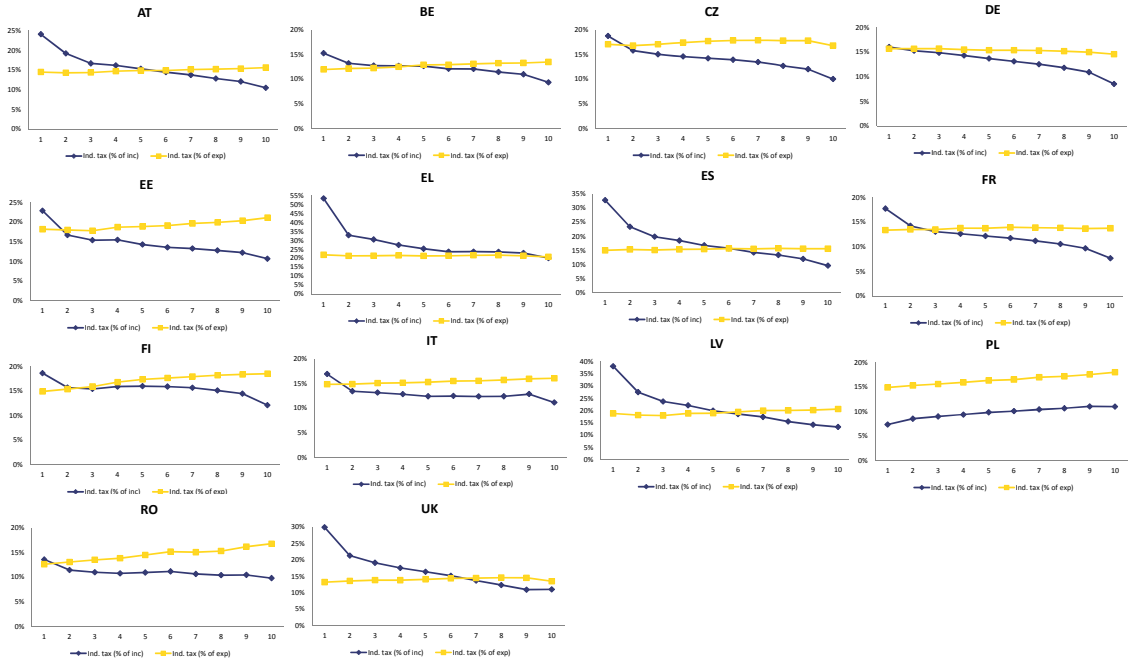
Modelling approach to the simulation of indirect taxes using EUROMOD

While tax shift reforms are seen as a way to promote growth friendly fiscal consolidation, their distributional consequences may be substantial. Against this background, a simulation of indirect taxes has been undertaken with EUROMOD. The project was conducted jointly by the Department of Economics of the University of Leuven and the Institute for Social and Economic Research (ISER) at the University of Essex.

EUROMOD is aimed initially at analysing direct taxation and benefits in cash. Extending the policy scope of EUROMOD to indirect taxes involves three main steps. ([148]) First, EUROMOD input data have to be enriched with information on household consumption expenditures. Second, EUROMOD needs to be equipped with a calculator for indirect tax liabilities. Third, behavioural assumptions have to be

([148]) The methodological approach is extensively explained in De Agostini et al. (2017).

Graph III.A1.1: **Indirect taxes as a percentage of disposable income and of expenditures (as a percentage of disposable income)**



Note: 2014 data for Germany, France, Italy, Spain; 2016 data for all the other Member States.
Source: Author's calculations based on EU-SILC.

imposed in order to study how changes in disposable income affect household expenditures and indirect tax liabilities.

In order to enrich EUROMOD input data with household-level information on expenditures, parametric Engel curves are estimated on the basis of Household Budget Surveys, which are aggregated to 15 non-durable and one durable commodity groups. ([149]) The estimated coefficients are subsequently used to impute aggregate expenditures into EUROMOD input data using the same set of control variables as in the estimation phase. For the simulation of tax liabilities, the indirect tax system (i.e., VAT rates as well as ad valorem and per unit excises) has been encoded at the detailed commodity level. In order to be applicable to imputed aggregate expenditures at consumer prices, a weighted sum of implicit indirect tax rates is computed in order to obtain households' indirect tax liabilities for a baseline policy year. Finally, simultaneous changes in direct and indirect taxes are simulated under the assumption that a constant share of income is devoted to each expenditure group, keeping the savings rate constant.

([149]) The commodity groups follow the Classification of Individual Consumption by Purpose (COICOP).

ANNEX 2

Supplement to Chapter III.3.

The EU-SILC database

The EU-SILC database is the major survey data set for comparative research on income equality and social inclusion in the European Union. ([150]) The survey collects detailed information on socio-demographic characteristics (age, educational background, health status), income sources (dependent or self-employed income, pension, investment income), and employment status (profession, working time, gross wages) for all members of the private households selected into the sample as well as information on household composition. The income reference period in EU-SILC is the year preceding the survey, e.g. 2011 for the EU-SILC operation of 2012. In 2012, EU-SILC covered around 591,482 individuals living in 237,478 private households in the 28 EU Member States. The EU-SILC database allows calculating indicators for market (i.e. before taxes and benefits) and disposable (i.e. after taxes and benefits) income, which consist of the following components (Table III.A2.1).

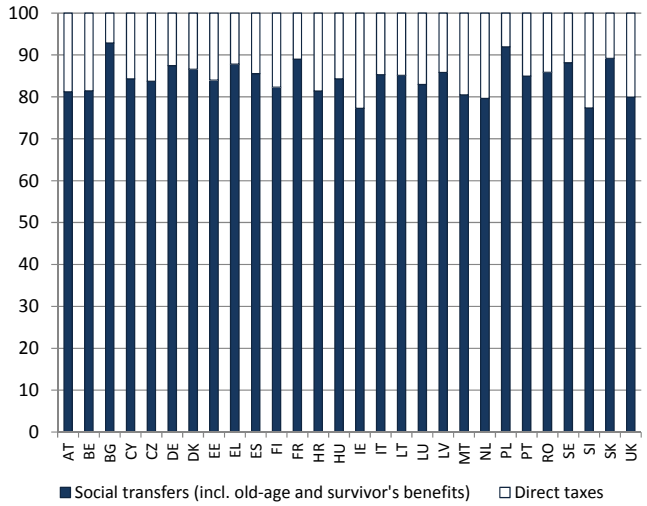
Table III.A2.1: **Components of market and disposable income**

Broad categories	More detailed categories	Market income	Disposable income
Labour income (incl. from self-employment)	• Gross employee cash or near cash income • Gross on-cash employee income • Gross cash benefits or losses from self-employment (including royalties)	✓	✓
Capital income	• Imputed rent • Income from rental of a property or land • Interests, dividends, profit from capital investments in unincorporated business	✓	✓
Other sources of market income	• Value of goods produced for own consumption • Regular inter-household cash transfers received • Income received by people aged under 16	✓	✓
Cash benefits and allowances	• Unemployment benefits • Old-age benefits (including pensions) • Survivor' benefits • Sickness benefits • Disability benefits • Education-related allowances • Family/children related allowances • Social exclusion not elsewhere classified • Housing allowances		✓
Direct taxes	• Tax on income and social insurance contributions • Regular taxes on wealth • Interest paid on mortgage		▪

Note: ✓(▪) means that the category provides a positive (negative) contribution to disposable or market income. See below for a description of EU-SILC variables and details on the items of direct taxes and social transfers included.
Source: EU-SILC database.

([150]) The database can be found at: http://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions

Graph III.A2.1: **Contributions to government redistribution: direct taxes vs. social transfers (average 2004-2014)**



Note: This graph shows the contributions to government redistribution, distinguishing between direct taxes and social transfers (including pensions).
Source: Author's calculations based on EU-SILC.

Background information on Gini elasticities ([151])

The Gini elasticities measure the impact of a marginal increase in the tax or benefit source on inequality of disposable income, holding income from other sources constant. The Gini elasticity is equal to the original contribution of the income source (k) to inequality minus its share in total income: $\frac{\partial G/\partial e}{G} = \frac{S_k G_k R_k}{G} - S_k$.

Following Lopez-Feldman (2006) the decomposition of the Gini elasticities can be explained intuitively as follows:

- the share of the income source with respect to total income (S_k), i.e. if an income source represents a large share of total income, it may potentially have a large impact on inequality;
- how equally or unequally distributed the income source is (G_k), i.e. if the income is equally distributed ($G_k = 0$), it cannot influence inequality (no matter its magnitude);
- the correlation of the income source with the distribution of total income (R_k), i.e. if the income source is large and unequally distributed (S_k and G_k are large), it may either increase inequality (R_k is positive and large, meaning it targets those at the top of the distribution) or decrease it (R_k is negative or close to 0, meaning it targets poor households).

Mathematically, the components are defined as follows:

$$R_k = \frac{\sum_k Cov(Y_k \; ; \; Rank)}{\sum_k Cov(Y_k \; ; \; Rank_k)}$$

([151]) This approach is proposed by Lerman and Yitzhaki (1985); see also Lopez-Feldman (2006).

$$G_k = 2\frac{\sum_k Cov(Y_k\ ;\ Rank_k)}{mean\_income_k}$$

$$S_k = \frac{mean\ income_k}{mean\ income}$$

- Where Y_k is income from tax (benefit) k (to an individual consumer or household);
- *Rank* is the rank of the individual receiving the income in the distribution of total income as measured by the cumulative distribution of total income;
- $Rank_k$ is the rank of the individual in the distribution of income from tax(benefit) k as measured by the cumulative distribution of income from tax(benefit) k;
- $mean\ income_k$ is the mean income received from tax(benefit) k;
- $mean\_income$ is the mean total income.

So S_k represents the share of the specific tax(benefit) over total income, G_k represents the Gini index computed with respect to the distribution based on income from tax(benefit) k and R_k is the Gini correlation of income from tax(benefit) k with the distribution of total income.

Table III.A2.2: **Impact of sub-components of the cash-benefit system on income inequality (Gini elasticities in per cent, remaining EU countries, average 2004-2014)**

		Gini elast.	S	G	R		Gini elast.	S	G	R		Gini elast.	S	G	R		Gini elast.	S	G	R		Gini elast.	S	G	R	
1	AT	-0,19	0,49	-0,49	-0,85	DK	-0,19	0,66	-0,35	-0,92	HR	-0,14	0,40	-0,61	-0,83	LV	-0,05	0,39	-0,65	-0,71	SE	-0,20	0,55	-0,37	-0,93	EU 28	-0,14	0,46	-0,55	-0,81	1
2		-0,03	0,34	0,82	0,29		-0,21	0,15	0,89	-0,19		-0,08	0,32	0,79	0,23		-0,19	0,42	0,69	-0,01		-0,17	0,24	0,85	0,01		-0,12	0,34	0,79	0,14	2
3		-0,08	0,09	0,64	-0,15		-0,06	0,04	0,59	-0,30		-0,03	0,04	0,87	-0,15		-0,02	0,08	0,82	0,23		-0,10	0,09	0,67	-0,18		-0,05	0,07	0,74	-0,12	3
4		-0,03	0,05	0,93	0,04		-0,05	0,08	0,89	0,04		-0,11	0,22	0,80	0,05		-0,02	0,08	0,87	0,13		-0,06	0,08	0,85	-0,01		-0,04	0,08	0,89	-0,01	4
5		-0,03	0,03	0,91	-0,25		-0,10	0,07	0,86	-0,19		-0,01	0,02	0,97	0,01		0,00	0,03	0,94	0,24		-0,04	0,03	0,93	-0,21		-0,02	0,04	0,94	-0,04	5
6		-0,01	0,01	0,97	-0,48		-0,02	0,01	0,96	-0,66		-0,01	0,01	0,97	-0,57		-0,01	0,01	0,95	-0,29		-0,04	0,01	0,96	-0,74		-0,02	0,01	0,95	-0,45	6
1	BE	-0,18	0,52	-0,53	-0,78	EE	-0,10	0,43	-0,54	-0,89	HU	-0,17	0,39	-0,62	-0,73	MT	-0,15	0,44	-0,55	-0,91	SI	-0,28	0,51	-0,52	-0,85	EU 15	-0,16	0,50	-0,53	-0,82	1
2		-0,15	0,25	0,85	0,01		-0,19	0,34	0,75	-0,11		-0,05	0,38	0,75	0,28		-0,16	0,38	0,76	0,00		-0,08	0,24	0,80	0,13		-0,10	0,31	0,82	0,18	2
3		-0,06	0,08	0,65	-0,07		-0,04	0,12	0,75	0,13		-0,11	0,12	0,69	-0,21		-0,05	0,06	0,72	-0,28		-0,07	0,08	0,75	-0,12		-0,06	0,06	0,71	-0,16	3
4		-0,06	0,05	0,93	-0,22		-0,05	0,08	0,83	-0,12		-0,06	0,09	0,87	-0,03		-0,04	0,06	0,91	-0,11		-0,08	0,13	0,78	-0,03		-0,04	0,06	0,92	-0,01	4
5		-0,09	0,09	0,88	-0,20		0,00	0,02	0,97	0,13		-0,03	0,02	0,92	-0,41		-0,01	0,02	0,98	-0,15		-0,01	0,02	0,95	-0,11		-0,04	0,05	0,92	-0,08	5
6		-0,02	0,01	0,99	-0,69		-0,01	0,01	0,98	-0,38		-0,02	0,01	0,93	-0,40		-0,04	0,04	0,85	-0,45		-0,03	0,01	0,93	-0,56		-0,02	0,02	0,94	-0,45	6
1	BG	-0,03	0,33	-0,59	-0,72	EL	-0,12	0,43	-0,65	-0,76	IE	-0,23	0,39	-0,72	-0,88	NL	-0,23	0,66	-0,40	-0,87	SK	-0,07	0,35	-0,54	-0,70	CEEC	-0,10	0,41	-0,57	-0,80	1
2		-0,19	0,49	0,66	0,03		-0,09	0,45	0,76	0,30		-0,08	0,28	0,83	0,18		-0,06	0,23	0,86	0,18		-0,16	0,41	0,76	0,01		-0,16	0,39	0,74	0,07	2
3		-0,02	0,05	0,84	-0,03		-0,01	0,02	0,89	-0,05		-0,12	0,14	0,66	-0,25		-0,04	0,03	0,58	-0,31		-0,04	0,08	0,70	-0,12		-0,04	0,07	0,78	-0,06	3
4		-0,03	0,10	0,85	0,15		-0,03	0,07	0,93	0,09		-0,06	0,07	0,89	-0,20		-0,05	0,04	0,95	-0,10		-0,06	0,12	0,84	-0,06		-0,05	0,10	0,85	-0,01	4
5		-0,01	0,02	0,95	0,13		-0,01	0,02	0,96	-0,05		-0,07	0,09	0,87	-0,10		-0,02	0,02	0,97	-0,01		-0,01	0,01	0,97	0,03		-0,01	0,02	0,96	-0,04	5
6		-0,01	0,01	0,96	-0,57		-0,01	0,01	0,96	-0,07		-0,03	0,03	0,83	-0,35		-0,05	0,02	0,96	-0,64		-0,02	0,02	0,97	-0,67		-0,01	0,01	0,95	-0,51	6
1	CY	-0,07	0,32	-0,59	-0,84	ES	-0,08	0,35	-0,68	-0,74	IT	-0,07	0,42	-0,55	-0,75	PL	-0,05	0,45	-0,43	-0,85	UK	-0,20	0,51	-0,59	-0,90	SCAND	-0,20	0,59	-0,39	-0,93	1
2		-0,06	0,43	0,86	0,21		-0,09	0,41	0,81	0,19		-0,08	0,47	0,74	0,31		-0,08	0,41	0,75	0,29		-0,12	0,32	0,81	0,16		-0,17	0,20	0,87	-0,05	2
3		-0,04	0,11	0,67	-0,04		0,00	0,02	0,96	0,13		-0,02	0,02	0,84	-0,10		-0,04	0,04	0,85	-0,30		-0,07	0,07	0,74	-0,27		-0,08	0,07	0,65	-0,22	3
4		-0,04	0,07	0,93	-0,16		-0,03	0,12	0,91	0,12		-0,01	0,04	0,95	0,14		-0,06	0,08	0,88	-0,07		-0,03	0,04	0,93	-0,13		-0,05	0,08	0,88	0,01	4
5		0,01	0,05	0,97	0,50		-0,03	0,10	0,88	0,05		0,00	0,04	0,91	0,30		-0,01	0,02	0,96	-0,03		-0,01	0,01	0,98	-0,25		-0,07	0,05	0,89	-0,22	5
6		0,00	0,02	0,98	0,13		0,00	0,01	0,99	0,05		0,00	0,00	0,99	0,09		-0,01	0,01	0,96	-0,56		-0,08	0,06	0,88	-0,45		-0,03	0,01	0,95	-0,69	6
1	CZ	-0,19	0,37	-0,56	-0,86	FI	-0,20	0,57	-0,45	-0,93	LT	-0,09	0,37	-0,62	-0,81	PT	-0,08	0,36	-0,70	-0,72											1
2		-0,30	0,41	0,73	-0,17		-0,12	0,21	0,87	0,03		-0,19	0,43	0,71	0,04		-0,02	0,48	0,79	0,42											2
3		-0,05	0,06	0,84	-0,22		-0,07	0,08	0,69	-0,18		-0,01	0,06	0,90	0,18		-0,02	0,03	0,81	-0,13											3
4		-0,07	0,13	0,82	-0,01		-0,04	0,07	0,90	0,01		-0,04	0,11	0,83	0,06		-0,04	0,09	0,89	0,07											4
5		-0,01	0,01	0,96	-0,20		-0,07	0,06	0,88	-0,25		-0,01	0,01	0,96	-0,04		-0,02	0,04	0,94	0,06											5
6		-0,02	0,01	0,97	-0,73		-0,03	0,02	0,95	-0,68		-0,02	0,02	0,95	-0,47		-0,01	0,01	0,96	-0,39											6
1	DE	-0,11	0,50	-0,52	-0,72	FR	-0,09	0,42	-0,48	-0,84	LU	-0,12	0,45	-0,52	-0,81	RO	-0,09	0,35	-0,61	-0,78											1
2		-0,14	0,35	0,80	0,15		0,00	0,39	0,81	0,35		0,01	0,30	0,85	0,36		-0,06	0,52	0,72	0,38											2
3		-0,06	0,07	0,64	-0,09		-0,06	0,07	0,73	-0,27		-0,09	0,12	0,59	-0,15		-0,03	0,04	0,81	-0,09											3
4		-0,03	0,04	0,94	-0,04		-0,01	0,03	0,95	0,05		-0,04	0,07	0,93	0,02		-0,05	0,08	0,91	0,00											4
5		-0,04	0,04	0,93	-0,13		-0,03	0,05	0,91	0,04		-0,02	0,04	0,96	-0,01		0,00	0,00	0,99	0,05											5
6		-0,03	0,01	0,96	-0,58		-0,05	0,04	0,86	-0,53		-0,04	0,02	0,93	-0,61		-0,01	0,01	0,92	-0,58											6

Note: Expenditure items considered: 1 - Direct taxes; 2- Pensions; 3- Education, family, children; 4- Survivor, sickness and disability; 5- Unemployment benefits; 6- Social exclusion, housing.
Source: Author's calculations based on EU-SILC.

Table III.A2.3: **Regression analysis - sources and summary statistics**

Variable	Source	Unit	Obs	Mean	Std. Dev.	Min	Max
Inequality measures							
Gini disposable income	SWIID	index	185	27,7	4,5	17,3	37,1
Gini market income	SWIID	index	185	43,9	6,5	23,0	58,6
COFOG fiscal variables							
Education exp.	OECD COFOG	% GDP	114	4,4	0,9	2,6	6,1
Health exp.	OECD COFOG	% GDP	115	5,4	1,3	2,3	7,9
Other wages/interm cons. exp.	OECD COFOG	% GDP	105	9,1	1,3	6,0	11,9
Old-age and survivor pensions exp.	OECD COFOG	% GDP	133	8,5	2,9	3,1	16,6
Sickenss and disability exp.	OECD COFOG	% GDP	146	2,9	1,6	0,2	11,9
Unemployment benefits exp.	OECD COFOG	% GDP	136	1,4	1,3	0,0	8,0
Family and children exp.	OECD COFOG	% GDP	142	1,9	1,1	0,4	5,7
Subsidies exp.	OECD COFOG	% GDP	154	1,6	0,8	0,0	4,0
Investment exp.	OECD COFOG	% GDP	153	3,7	0,9	1,8	6,7
Other primary expenditure	OECD COFOG	% GDP	102	4,5	1,5	1,6	9,9
Property income paid exp.	OECD COFOG	% GDP	153	3,4	2,3	0,1	11,1
Main control variables							
Govt. headline balance	Ameco	% GDP	156	-3,2	3,1	-12,4	4,1
Real GDP per capita	IMF WEO	1,000 USD	171	27,9	17,7	3,4	104,9
Real GDP growth	Ameco	%	133	2,5	1,9	-4,9	10,1
Value added high-medium tech	OECD	% tot value-addec	97	3,2	1,7	0,3	7,8
Openness	Ameco	% GDP	179	48,8	29,9	14,5	187,5
Unemp. rate	Ameco	%	163	8,6	3,9	2,1	23,3
Part-time work	OECD	% tot. employed	143	14,4	10,2	1,8	60,6
Share pop > 65	Ameco	% tot. population	196	14,4	2,7	9,4	21,2
# school years	Barro and Lee (2016)	years	196	9,7	1,5	5,0	12,8
Govt. left	Comparative Political Data Set	cabinet posts of social democr. & other left parties in % of total cabinet posts	172	35,8	28,6	0,0	100,0

Note: The table shows summary statistics for the sample of 28 EU countries between 1980 and 2014 based on 5-year averages.
Source: Author's calculations.

Table III.A2.4: **Regression analysis - correlation matrix**

	Inequality measures		*COFOG fiscal variables*											*Main control variables*									
	Gini disposable income	Gini market income	Education exp.	Health exp.	Other wages/interm cons.	Old-age/survivor pensions	Sickenss and disability	Unemployment benefits	Family and children exp.	Subsidies exp.	Investment exp.	Other primary exp.	Property income paid exp.	Govt. headline balance	Real GDP per capita	Real GDP growth	VA high-medium tech	Openness	Unemp. rate	Part-time work	Share pop > 65	# school years	Govt. left
Gini disposable income	1																						
Gini market income	0,69	1																					
Education exp.	-0,15	0,07	1																				
Health exp.	-0,30	0,10	0,14	1																			
Other wages/interm cons. exp.	-0,26	-0,11	0,35	-0,11	1																		
Old-age/survivor pensions exp.	0,07	-0,07	-0,07	0,25	-0,05	1																	
Sickenss and disability exp.	-0,40	-0,09	0,24	0,37	0,30	-0,31	1																
Unemployment benefits exp.	-0,23	-0,04	0,21	0,40	-0,05	-0,09	0,57	1															
Family and children exp.	-0,61	-0,33	0,40	0,33	0,14	-0,09	0,39	0,46	1														
Subsidies exp.	-0,61	-0,43	0,09	0,22	0,13	0,05	0,21	0,17	0,38	1													
Investment exp.	-0,19	-0,31	0,06	-0,18	0,16	-0,15	0,12	-0,34	0,07	0,23	1												
Other primary expenditure	-0,27	0,27	-0,01	0,29	0,07	0,06	0,16	0,18	0,38	0,17	-0,29	1											
Property income paid exp.	0,00	0,07	0,07	0,13	0,07	0,16	0,06	0,44	-0,08	0,14	-0,25	0,11	1										
Govt. headline balance	-0,30	-0,30	0,08	-0,11	-0,10	-0,21	0,07	-0,06	0,35	-0,03	0,15	-0,27	-0,55	1									
Real GDP per capita	-0,54	-0,10	0,01	0,36	-0,27	0,11	0,09	0,21	0,43	0,06	-0,15	0,31	-0,04	0,33	1								
Real GDP growth	0,30	-0,11	-0,05	-0,55	-0,22	-0,37	-0,10	-0,17	-0,12	-0,09	0,05	-0,29	-0,19	0,319	-0,39	1							
Value added high-medium tech	-0,01	-0,16	-0,15	0,22	0,11	0,13	0,13	0,00	-0,16	0,31	-0,14	0,03	0,13	-0,06	-0,36	0,02	1						
Openness	-0,14	0,10	-0,03	-0,12	-0,19	-0,18	-0,15	-0,19	0,03	-0,04	-0,09	-0,05	-0,18	0,16	0,36	0,14	-0,19	1					
Unemp. rate	0,34	0,37	-0,01	-0,09	0,12	0,06	-0,14	0,02	-0,40	-0,27	-0,27	-0,10	0,20	-0,46	-0,31	-0,13	-0,07	-0,10	1				
Part-time work	-0,12	0,01	0,01	0,38	-0,10	-0,09	0,33	0,24	0,13	-0,04	-0,37	0,14	0,03	0,15	0,57	-0,26	-0,24	0,07	-0,27	1			
Share pop > 65	-0,66	-0,14	0,10	0,33	0,10	0,39	-0,13	-0,16	0,02	-0,18	-0,07	-0,08	0,02	-0,03	0,62	-0,46	0,10	-0,10	0,20	0,06	1		
# school years	-0,48	-0,10	-0,15	0,11	0,05	-0,28	0,02	-0,32	0,01	-0,19	-0,14	0,25	-0,14	-0,05	0,56	-0,29	0,14	0,37	0,27	0,19	0,70	1	
Govt. left	-0,15	-0,05	0,06	0,11	0,10	0,11	0,12	0,02	0,24	-0,01	0,16	0,19	0,00	0,02	0,02	-0,02	-0,01	-0,13	-0,06	-0,03	0,12	-0,09	1

Note: The table shows the correlation matrix for the sample of 28 EU countries since 1980 based on 5-year averages.
Source: Author's calculations.

Table III.A2.5: **Regression findings - sensitivity analyses for fiscal variables**

	(1) Sys GMM	(2) Sys GMM	(3) Sys GMM	(4) Sys GMM	(5) Sys GMM	(6) Sys GMM	(7) Sys GMM	(8) Sys GMM	(9) Sys GMM
Control variables									
ln gini	t-1	t-1	t-1	t-1	t-1	t-1	t-1	t-1	t-1
ln gini market income	t	t	t	t	t	t	t	t	t
ln real GDP pc	t-1	t-1	t-1	t-1	t-1	t-1	t-1	t-1	t-1
ln govt. headline balance	t-1	t-1	t-1	t-1	t-1	t-1	t	t	t
ln unemp. rate	t-1	t-1	t-1	t-1	t-1	t-1	t	t	t
ln openness	-	t-1	t-1	t-1	t-1	t-1	t-1	t-1	t-1
ln share pop > 65	-	-	t-1	t-1	t-1	t-1	t-1	t-1	t-1
ln # school years	-	-	-	t-1	t-1	t-1	t	t	t
ln govt. left	-	-	-	-	t-1	t-1	-	t	t
ln personal inc. tax revenues (t-1)	-	-	-	-	-	t-1	-	-	t
The following fiscal expenditure items are included one-by-one controlling for the variables listed above									
	variables are lagged						***variables are not lagged***		
ln education exp.	-0.056	-0.053	-0.116**	-0.115***	-0.115***	-0.064*	-0.131**	-0.099**	-0.089**
	(-1.282)	(-0.970)	(-2.544)	(-2.631)	(-2.886)	(-1.957)	(-2.397)	(-2.377)	(-1.985)
ln health exp.	-0.062*	-0.054*	-0.021	-0.004	-0.029	-0.101**	-0.078*	-0.077*	-0.116**
	(-1.696)	(-1.728)	(-0.577)	(-0.100)	(-0.793)	(-2.527)	(-1.700)	(-1.700)	(-2.501)
ln other wages/interm cons. exp.	-0.082	-0.063	-0.103	-0.078	-0.072	-0.057	-0,15	-0.028	-0.082
	(-0.570)	(-0.708)	(-1.024)	(-0.992)	(-0.744)	(-0.950)	(-1.468)	(-0.279)	(-0.985)
ln old-age & survivor pensions exp.	0.069	0.014	0.085	0.067	0.052	0.066	0.018	0.056	-0.008
	(1.021)	(0.484)	(1.165)	(1.561)	(1.054)	(1.181)	(0.558)	(0.884)	(-0.302)
ln sickness and disability exp.	-0.044**	-0.036***	-0.028*	-0.036**	-0.031**	-0.043**	-0.051***	-0.054***	-0.061*
	(-2.519)	(-2.581)	(-1.938)	(-2.368)	(-2.269)	(-2.539)	(-2.830)	(-3.082)	(-1.886)
ln unemployment benefits exp.	-0.003	-0.015	-0.025	-0.011	-0.011	-0.012	-0.024	-0.030	-0.022
	(-0.189)	(-1.216)	(-1.431)	(-0.867)	(-1.101)	(-1.379)	(-1.505)	(-1.604)	(-1.235)
ln family and children exp.	-0.021	-0.034*	-0.041**	-0.044*	-0.049**	-0.048**	-0.076**	-0.050	-0.052***
	(-0.685)	(-1.813)	(-2.130)	(-1.890)	(-2.414)	(-2.224)	(-2.462)	(-1.263)	(-2.934)
ln subsidies exp.	-0.013	-0.013	-0.029	-0.009	-0.027	-0.024	-0.023	-0.023	-0.029
	(-0.525)	(-0.526)	(-0.766)	(-0.286)	(-0.926)	(-1.462)	(-0.738)	(-0.884)	(-1.630)
ln investment exp.	-0.014	-0.008	-0.026	-0.026	-0.021	-0.009	-0.020	0.001	0.017
	(-0.332)	(-0.181)	(-0.797)	(-0.743)	(-0.574)	(-0.316)	(-0.452)	(0.018)	(1.156)
ln other primary exp.	-0.056	-0.072*	-0.034	-0.033	-0.045	-0.052	-0.047	-0.029	-0.013
	(-1.585)	(-1.811)	(-0.935)	(-0.911)	(-1.074)	(-1.583)	(-1.075)	(-0.825)	(-0.432)
ln property income paid exp.	0.016	0.022	0.014	0.015	0.010	0.014	-0.017	-0.006	0.005
	(0.901)	(0.855)	(0.575)	(0.643)	(0.408)	(0.750)	(-0.748)	(-0.204)	(1.610)

Note: The table shows robustness test for the impact of fiscal policy items on the Gini index of disposable income. The specifications test the robustness of the fiscal expenditure items by using different types of baseline regressions, which are listed in the upper panel of this table. To avoid multicollinearity, the fiscal sub-components are not included altogether, but added one-by-one to the specification. For more details on the estimation approach used see note of Table 4. ***, ** and * denote respectively statistical significance at 1, 5 and 10%.
Source: Author's calculations.

ANNEX 3
Supplement to Chapter III.4.

A3.1. BACKGROUND INFORMATION ON THE MICROSIMULATION MODEL EUROMOD

EUROMOD is the microsimulation model for the European Union. It encodes the tax and benefit systems of all Member States in a harmonised way and calculates income taxes, social contributions, cash benefits, and disposable income for individuals and households in the underlying input data, which are derived from the European Statistics on Income and Living Conditions (EU-SILC). As EU-SILC data are based on a survey and therefore published with a certain time lag, monetary values are brought in line with the policy year of interest by applying uprating factors as the consumer price index and statutory adjustment rules (e.g., for pensions and social benefits). EUROMOD allows assessing the budgetary, distributional, and equity impact of a country's tax and benefit system as well as actual or hypothetical reforms thereof. ([152])

Microsimulation models are useful tools to analyse the impacts of tax and social benefits reforms on inequality for a variety of reasons:

- First, the use of micro-data allows for a precise estimate of the distributive impacts of policy reforms. Microsimulation models can be eventually combined with micro-labour supply models to investigate the behavioural reactions to tax policy changes (see in particular Bargain et al. (2014)).

- Second, taxes and social benefits policies are often closely interconnected, and the use of micro simulations aims at considering those interactions. For instance a reduction in personal income tax rates affecting low tax brackets could be automatically compensated by a reduction in some social benefits (such as for instance child benefits) if these were calculated with reference to after-tax income. These aspects are often over-looked in purely macroeconomic models, although they might have non-negligible impacts on certain categories of households. In the same vein, some tax expenditures (i.e. tax credit and tax allowances affecting the tax rate and bases) might be refundable, i.e., leading to a direct cash transfer by the government. This is for instance sometimes the case for mortgage interest tax rebates, family-related deductions or in-work benefits, which can have non negligible impact on income inequality (see in particular Barrios et al. (2016)). The existence of tax expenditures and social benefits linked to taxes implies that any change in tax policy might trigger interactions within the entire tax and benefit systems.

The approach proposed by Bargain and Callan (2010) provides a decomposition framework to isolate the impact of policy changes from changes in market incomes and population characteristics using the EUROMOD microsimulation model. Importantly the use of EUROMOD ensures that this approach is applied consistently across European countries allowing cross-country analysis. Following this approach, the actual distribution of household disposable incomes in a given year is compared with a counterfactual scenario of income distribution assuming that the policies of the initial period are still in place, while keeping population characteristics and market incomes constant. To build the counterfactual scenario for the evolution of market incomes, one can alternatively use average market income or consumption prices to index tax brackets and benefits amounts, although both options have pros and cons.

A3.2. ADDITIONAL COEFFICIENTS FOR AUTOMATIC STABILISATION OF INCOME AND DEMAND FROM A MICROECONOMIC PERSPECTIVE

As indicated in the main text, we also calculated the income and demand stabilisation coefficients based on the country and individual level. This Section provides more information on the computation.

([152]) An extensive introduction to EUROMOD is provided by Figari and Sutherland (2013), which can be accessed via the EUROMOD homepage (https://www.euromod.ac.uk/).

Income stabilisation coefficients

Income stabilisation coefficient at the country level (τ_c)

The indicator is computed as the difference between the aggregated country-level variations in household resources in absence and in presence of a tax and benefit system, expressed as a share of the aggregated change in market income (methodology in line with Dolls et al., 2012). It provides a single coefficient per country:

$$\tau_c = 1 - \frac{\sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M}$$

A key drawback of the country-level ISC is that it misses the distributional dimension of automatic stabilisation. In the expression above both changes in disposable (ΔY_i^D) and in market incomes (ΔY_i^M) are aggregated at the national level so that the τ_c indicator misses the distributional dimension of automatic stabilisation. Since households' circumstances differ, they will also experience different degrees of automatic stabilisation provided by the tax and social benefits systems. Two modifications of the τ_c index hence consist of a household and individual-specific extension.

Income stabilisation coefficient at the individual level ISC $(\boldsymbol{\tau_i})$

This indicator computes the cushioning effect of the tax and benefit system on household disposable income if household members were to experience the shock one at the time (methodology in line with Jara and Tumino, 2013). Adopting an iterative approach, market income is modified for one person at a time keeping constant the resources of the other household members. Household disposable income is hence re-computed at each iteration. The next equation describes the calculation of this alternative measure:

$$\tau_i = 1 - \frac{\Delta Y_{h,i}^D}{\Delta Y_{h,i}^M}$$

Where $\Delta Y_{h,i}^M$ measures the change in the income of individual *i* in household *h* and $\Delta Y_{h,i}^D$ measures the change in the household disposable income when only the market income of the individual *i* is modified. τ_i, differs from τ_h because in the latter the market incomes of all the household members are modified at once, while in τ_i incomes are modified individual by individual and changes in household disposable income are computed at each iteration. Similar to τ_h, it is possible to derive an empirical distribution of τ_i.

Demand stabilisation coefficients

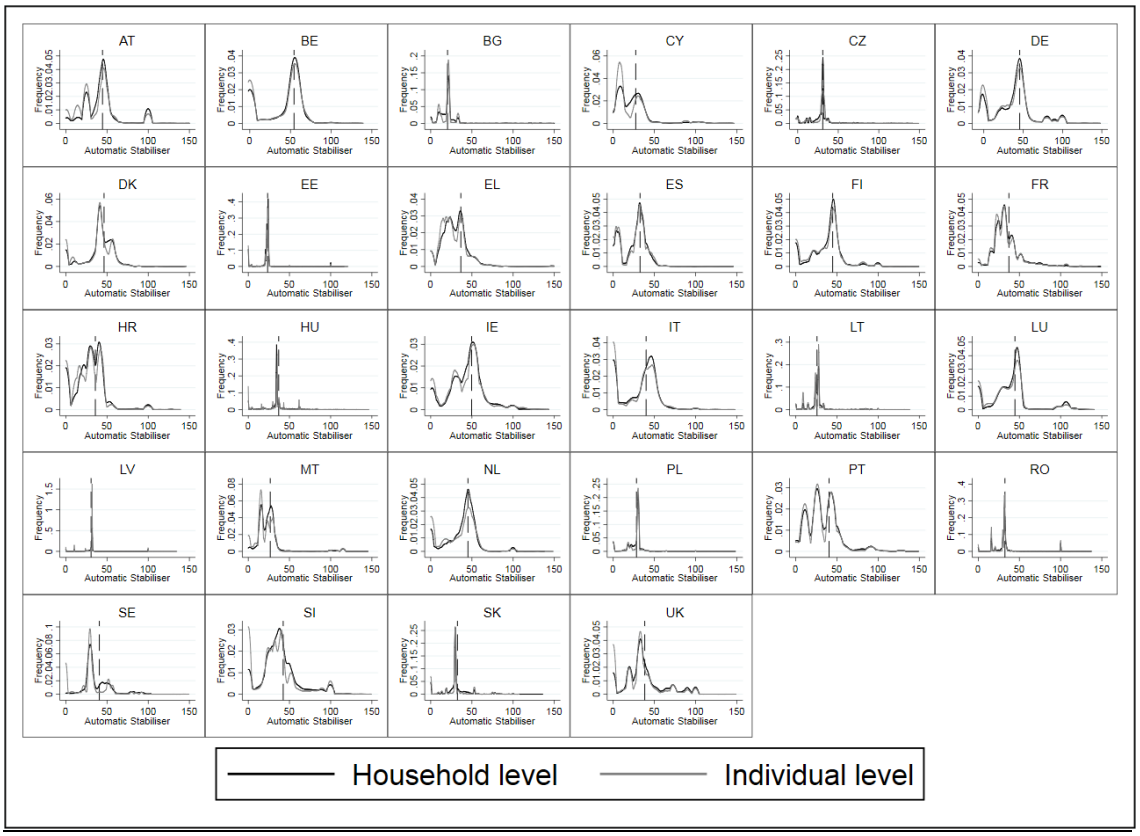
Similar to the income stabilisation indicators, it is possible to compute three demand stabilisation indicators which are summarised by the formulas below:

$$\theta_c = 1 - \frac{\sum_i (\alpha_h * \Delta Y_i^D)}{\sum_i \Delta Y_i^M}$$

$$\theta_i = 1 - \frac{\alpha_h * \Delta Y_{h,i}^D}{\Delta Y_{h,i}^M}$$

where θ_h and θ_i the demand stabilisation coefficients at the household and at the individual level respectively. α_h stands for the marginal propensity to consume of individuals belonging to household h. ([153])

Graph III.A3.1: **Kernel densities**



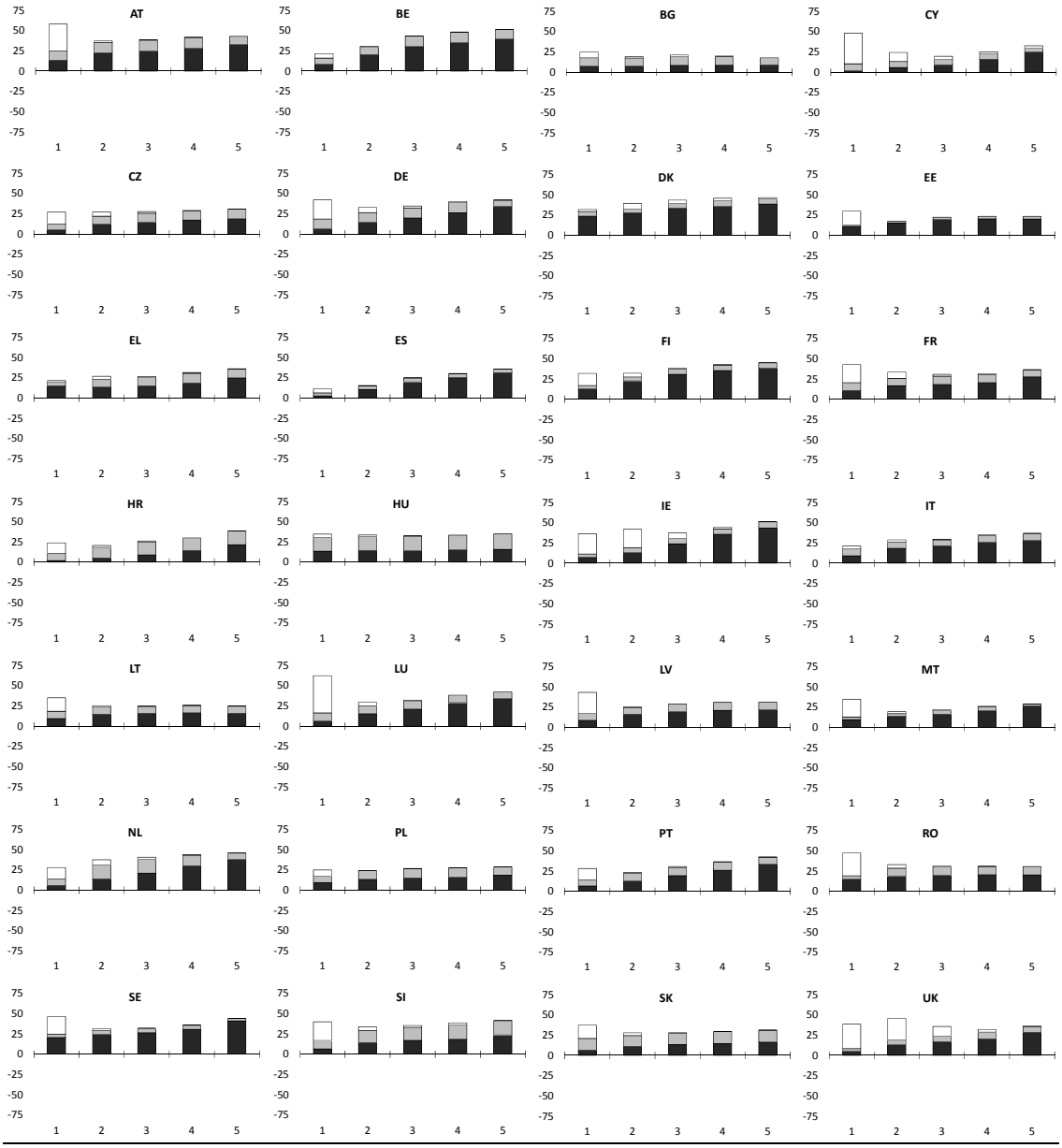
Source: Author's calculations based on EU-SILC.

([153]) Note that the interpretation of the demand stabilisation coefficient used here differs from the one used in an influential academic paper (Dolls et al., 2012), where the demand stabilisation coefficient is computed according to the formula:

$$\theta^{DFP} = \frac{\sum_i(\alpha_h * \Delta Y_i^M) - \sum_i(\alpha_h * \Delta Y_i^D)}{\sum_i \Delta Y_i^M}$$

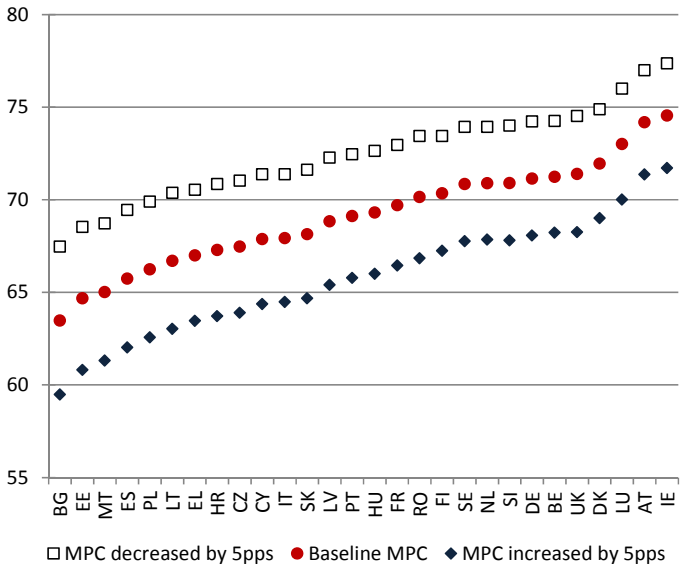
θ^{DFP} and θ_c measure different concepts of stabilisation. While θ_c informs on the share of an income shock which is (not) reflected in changes in the demand, θ^{DFP} identify the role plaid by automatic stabilisers alone by comparing variation in household demand in absence and in presence of automatic stabilisation.

Graph III.A3.2: **Income stabilisation by quintile**



Source: Author's calculations based on EU-SILC.

Graph III.A3.3: **Demand stabilisation, sensitivity analysis**



Note: The graph reports a sensitivity analysis of the demand stabilisation, consisting in increasing/decreasing the marginal propensity to consume (MPC) by 5pps relative to each quintile of disposable income. The graph shows that increasing MPC leads to a reduction in demand stabilisation as intuitively demand will be more responsive to income shocks. Additionally, the graph confirms the importance of correctly assessing the MPC, as modifications in its values significantly affect the demand stabilisation coefficients.
Source: Author's calculations.