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Vertical and Horizontal Redistribution: The Cases of Western and Eastern Europe*

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Abstract

European countries have the world's most redistributive tax and transfer systems. While they have been well equipped to deal with vertical inequality – that is, fostering redistribution from the rich to the poor – less is known about their performance in dealing with horizontal inequality, that is, in redistributing among socio-economic groups. In a context where individuals may not only care about vertical redistribution, but also about the economic situation of the specific groups they belong to, the horizontal dimension of redistribution becomes politically salient and can be a source of social tensions. We analyze the performance of the 28 EU countries on redistribution across i) age groups; ii) occupational groups; and iii) household types over the period 2007-2014 using counterfactual simulation techniques. We find a great degree of heterogeneity across countries: changes in the tax and transfer system have particularly hit the young and the losers of occupational change in Eastern European countries, while households with greater economic security have benefited from these changes. Our findings suggest that horizontal inequality is a dimension which policy makers should take into account when reforming tax and transfer systems.

JEL: C63, D31, D63, H22

Keywords: Vertical inequality, Horizontal inequality, Tax and Transfers, Incidence analysis, Europe.

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1. Introduction

One characteristic of European societies is their strong degree of income redistribution, resulting from progressive taxation and relatively generous transfers, as well as extensive regulations to protect the poor. The evolution of the "European-style" welfare system, its common vision and its idiosyncrasies, its affordability and its challenges are all subjects to a large body of literature, showing a consensus that this system[2] has managed to strongly reduce inequality in incomes. Considering that Europe redistributes to a much larger scale than the US, Alesina, Glaeser and Sacerdote (2001) go as far as asking the question of "*Why Doesn't the United States Have a European-Style Welfare State?*".

It is well-known that the redistribution taking place in Europe is the largest compared to other major OECD economies (see Figure 1 in section 2.1). The European Union's average level of redistribution equals 21 Gini points. This is significantly larger compared to other high-income countries, such as Japan (16 Gini points), Australia (15 Gini points), USA (11 Gini points), Switzerland (9 Gini points), and South Korea (5 Gini points), as well as compared to upper middle income economies with comparable market income inequality, such as Russia (11 Gini points), Chile (3.2 Gini points), Turkey (2.5 Gini points), and Mexico (1.9 Gini points).

This relatively generous size of redistribution in EU countries is not a surprise: it is one of the defining characteristics of the region's welfare systems. However, there has been a growing sense of discomfort with welfare systems among European citizens: as perceptions of inequality have increased in a context where traditional indicators of inequality have not shown big changes, the adequacy of the tax and transfer system has been put into question (Bussolo et al., 2018).

This growing uneasiness in European societies brings up two dimensions along which welfare systems shall be analyzed: first, it is of relevance to assess the *change* in the redistribution. The stability of disposable income inequality could have been the result of a bigger redistributive effort if market income inequality has increased, or it could have resulted from a smaller redistributive effort in the opposite scenario. Second, the vertical dimension of redistribution may not be the only relevant one: horizontal redistribution - that is, redistribution across groups not defined by income levels but by other, non-monetary variables such as age, occupation or household composition - may be of increasing importance, as perceptions of inequality are rather driven by a person's immediate context – their reference group – than by the economy as a whole (Bussolo, Ferrer-i-Carbonell, Giolbas and Torre, 2018). By evaluating the change in both vertical and horizontal redistribution, this paper addresses both issues.

We use the microsimulation model EUROMOD based on EU-SILC data for the EU-28 countries to compute the Gini coefficients for market income, market income plus pensions, and

[2] It is also possible to speak of a "family" of European systems, which differ in the tightness of labor market regulations, or the universality of benefits and pensions. See Esping-Andersen (1990) for a typology of welfare systems in Europe and their historical origins. Eastern European systems have a smaller degree of redistribution than Western European systems, for instance (see, e.g., Fuest, Niehues and Peichl, 2010, or Kammer, Niehues and Peichl 2012).

disposable income in order to measure redistribution. Next, we use counterfactual decomposition techniques to assess the change in redistribution and to isolate the effects of policy changes. In addition to vertical redistribution, we pay special attention to horizontal redistribution between socio-economic groups. We find that the majority of EU member states have experienced an increase in overall redistribution between 2007 and 2014, with the exception of some Eastern European countries that effectively flattened their income tax schedule. The drivers of these changes differ across countries: in certain cases, increased redistribution results from changes in market incomes, in other cases from tax-benefit changes, sometimes linked to tax-based budget consolidation, in particular in Southern Europe.

When assessing the incidence of taxes over time, our results show that in Southern and Western Europe both automatic stabilization effects and active changes in the tax system have worked in the same direction and alleviated the burden on younger generations, who have been hit especially hard following the financial crisis, while in Eastern Europe, discretionary policy changes had the potential to increase intergenerational tensions.

No clear pattern emerges when analyzing across occupations and job types. Some countries, such as Germany, have actively compensated for job polarization while other countries, such as Poland, have predominately favored individuals in non-routine cognitive occupations benefitting from job polarization. In most other countries, policymakers have yet to act upon increasing job polarization and tax incidence is mainly driven by changing market incomes.

We also assess developments when differentiating by benefit-recipient status. Most countries have implemented progressive policy changes that lead to increasing transfers to households depending on transfers. Policies vary much more once households with income earners are considered. In particular in Eastern Europe, increasing efficiency has dominated the redistributive motive and many countries have actively lowered the tax burden on single and dual earner households, i.e. the households with traditionally large tax burdens. In contrast, tax burden increases are most often driven by budget consolidation considerations and mainly observed in countries affected by the financial crisis, such as Greece and Portugal.

Our analysis relates to the literature in the following ways. Kanbur (2018) presents a theoretical treatment of how progressivity in the vertical redistribution, i.e. across income groups, can be negatively affected if this redistribution also implies transfers among socio-politically relevant (horizontal) groups. Paulus and Tasseva (2017) analyze how changes in tax-benefit policies and market incomes have influenced income distributions in Europe. Our paper additionally focuses on population subgroups, job types, and intergenerational analysis. Dolls, Doorley, Paulus, Schneider and Sommer (2018) look at distributional changes from demographic change (upskilling, population aging), relying on demographic projections for analysis. We focus on the current demographic structure but analyze how age groups have been affected differently. Other papers that study inequality and redistributive policies after the financial crises focus on a subset of countries or income years (Navicke 2017, Callan, Doorley, Savage 2018, Bargain, Callan, Doorley, Keane 2017) or focus on specific measures of austerity (Paulus, Figari, Sutherland 2017). Dolls, Fuest, Peichl (2012) and Dolls, Fuest, Peichl, Wittneben (2018) analyze the

capacity of European tax benefit systems to act as an automatic stabilizer in times of income changes and how this capacity has been affected by policy changes.

2. Assessing vertical redistribution

2.1 Measuring redistribution

Redistribution is typically measured using the Reynolds-Smolensky index of redistribution as the difference between the Gini coefficients of market income and disposable income:

$$RS = \left[Gini^{market} - Gini^{disposable}\right]$$

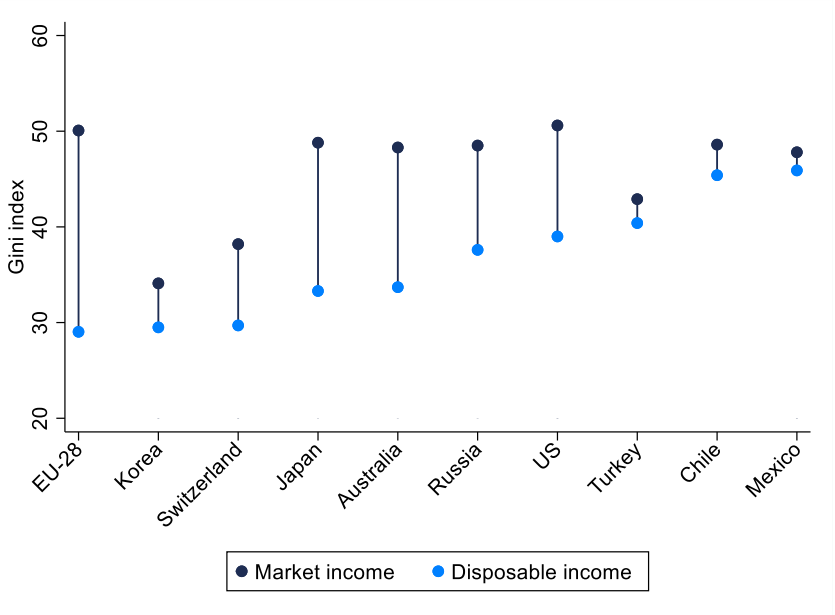
Figure 1, which is based on the OECD Income Distribution and Poverty Database[3], shows the Reynolds-Smolensky index of redistribution for a selection of countries. The European Union's average level of redistribution equals 21 Gini points. This is almost twice as large as the redistribution occurring in the US, amounting to 11 Gini points.

The Gini difference is a measure of the redistributive effectiveness of taxes and transfers at a given point in time: the larger the difference, the larger the impact of taxes and transfers on reducing inequality in market incomes. Market incomes include gross labor incomes and earnings from employment and self-employment (both permanent and temporary jobs), capital income, incomes from property as well as private pensions. Disposable incomes equal market income minus direct taxes and social insurance contributions (for both employees and self-employed), plus any additional transfers (such as pensions, means tested benefits and non-means tested benefits). Direct taxes include for example personal income taxes, taxes on capital dividends and interests, as well as property taxes.[4] Incomes are observed at the household level and weighted with the modified OECD equivalence scale. The Gini coefficients for market income, market income plus pensions, and disposable income for the EU-28 countries have been calculated using the microsimulation model EUROMOD (see Annex B for a description of the model), and are reported in Figure 2 below.

[3] Available at http://stats.oecd.org/Index.aspx?DataSetCode=IDD.

[4] As is common in the literature, due to data limitations, indirect taxes (e.g. consumption taxes and VAT) are not part of the analysis.

Figure 1. Gini index for market and disposable income in EU-28 and non-EU countries



Source: OECD Income Distribution and Poverty Database. In the case of Turkey, the Gini of Market Income corresponds to post tax, pre transfers income.

While, on average, tax and transfer systems in EU countries significantly reduce market income inequality, redistribution varies substantially across countries**.** In general, tax-benefits systems contribute to reducing market income inequality primarily through pensions and secondly through transfers and direct taxes (Figure 2). On average, across the EU-28 countries, public pensions contribute to reducing inequality in market income by almost 12 Gini points, while direct taxes and transfers (including means-tested and non-means tested benefits) reduce inequality in market income plus pensions by around 9 Gini points. Overall, the total contribution of taxes and transfers to the reduction of inequality within the EU countries generated by market incomes amounts to 21 Gini points on average. However, there is quite a bit of variation across EU member countries. According to Figure 2, with 14.9 Gini points of redistribution, Lithuania is the European country which redistributes the least, while with 27.5 points, Belgium is the one which redistributes the most. Interestingly, redistribution size does not seem to correlate with market income inequality, but tends to be higher in countries with high market income levels. For example, Romania and Ireland have a similar, relatively high Gini index of market income, but the former country reduces it by only 18 points, while the latter reduces it by 27 points. Conversely, the size of redistribution in Bulgaria and in the Netherlands is quite similar, but the Bulgarian Gini index of market income is 51, while that of the Netherlands is almost 10 points lower.

Figure 2. Gini index for different income concepts in EU-28 countries, ranked by size of redistribution

Source: Authors' calculations based on EUROMOD H1.0+.

2.2 Measuring change in redistribution

Assessing a change in the redistribution consists of determining whether the difference between the inequality of market incomes and that of disposable incomes has increased or decreased during a certain period. In terms of Figure 2, this corresponds to asking whether the bars representing these differences have become longer or shorter. In more formal terms, the change is defined as:

$$\Delta RS_{t_1,t_0} = RS_{t_1} - RS_{t_0}$$

$$= \left[Gini_{t1}^{market} - Gini_{t1}^{disposable}\right] - \left[Gini_{t0}^{market} - Gini_{to}^{disposable}\right]$$

$$= \left[Gini_{t_1}^{market} - Gini_{t_0}^{market}\right] - \left[Gini_{t_1}^{disposable} - Gini_{t_0}^{disposable}\right]$$

The larger this "double-difference" $\Delta Redistribution_{t_1,t_0}$, the larger is the redistribution over time within each country. Note that the change in the redistribution over time can be re-written as the difference between the change in the market income distribution and the change in the disposable

income distribution, as shown in the third line of the expression above. Consider the case in which the double-difference is exactly equal to zero. This means that an increase (decrease) in inequality generated by market forces is exactly equal to the increase (decrease) in the inequality in disposable incomes, i.e. there has not been any additional redistribution.[5] On the other hand, if the expression is larger than zero, redistribution has increased over time.

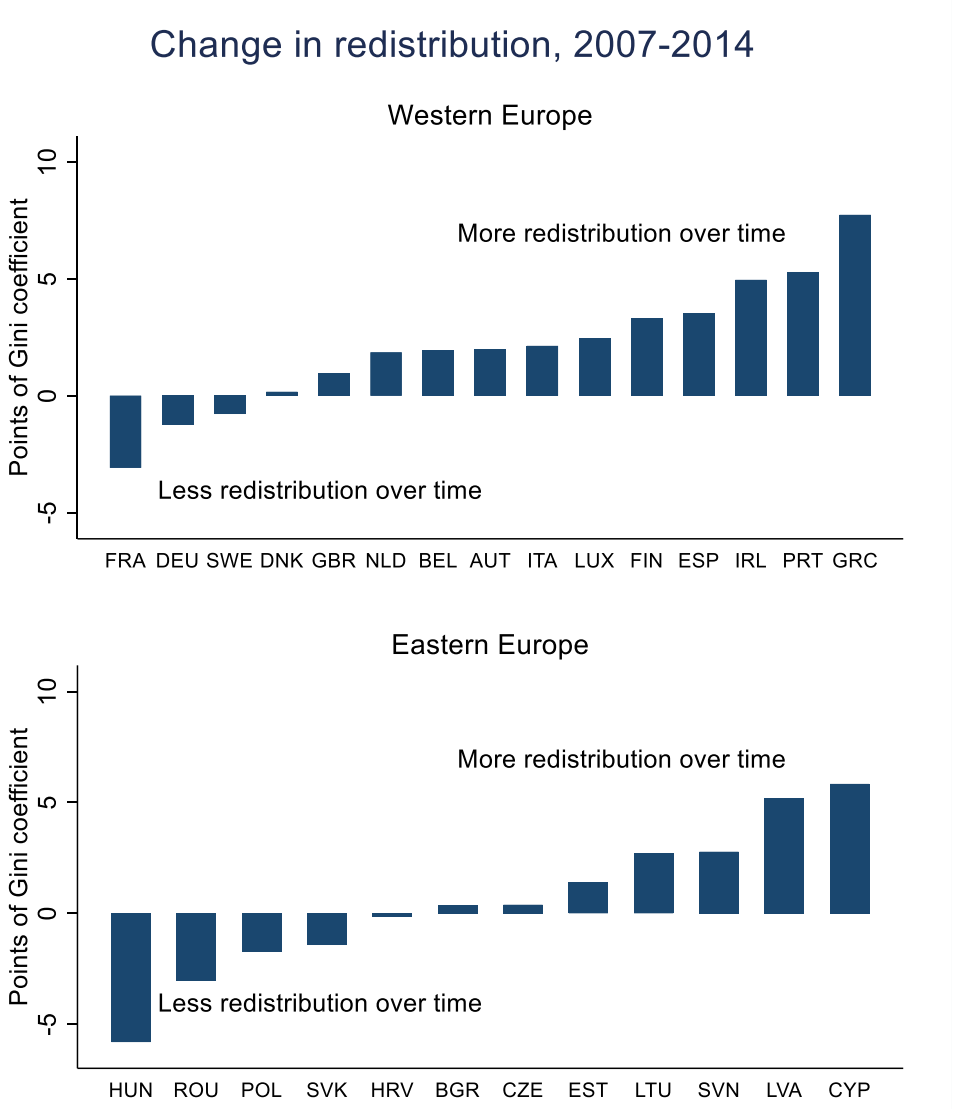
Using this double-difference, Figure 3 plots $\Delta RS_{2014,2007}$ for Western and Eastern EU countries. The values on the vertical axis correspond to Gini points. The chart shows that in Western Europe, the size of the redistribution has increased in most countries between 2007 and 2014.[6] The largest increase in the size of redistribution among Western European countries can be observed in Greece, where the reduction in market income inequality grew by 7 Gini points – although, as we show later, most of this change was not due to changes in taxes and transfer policies but rather to an almost automatic effect in a context of worsening market incomes. On the contrary, in Germany, Sweden and France, the redistributive effects of taxes and transfers have slightly declined.

In Eastern Europe, the evidence is mixed: in about half of the countries, redistribution has increased over time, while in the other half, it has decreased. In Hungary, for instance, there has been a significant reduction in redistribution between 2007 and 2014, equivalent to over 5 Gini points. Reductions in the size of the redistribution are also observed in Romania, Poland, Slovakia and Lithuania.

[5] In this case, inequality levels are indeed going up. Note, however, that maintaining the same level of redistribution at higher levels of inequality may still mean that the redistribution systems play a larger role. As Kanbur (2018) highlights, in this case of higher levels of inequality, the volume of redistribution is higher.

[6] 2007 was chosen as a reference year as it was the earliest year available in EUROMOD. This year also has the advantage that it pre-dates the financial crisis. 2014 was the most recent year in which survey data was available when running the simulations in the first quarter of 2018. Later years' simulations were also based on 2014 survey data.

Figure 3. The change in the size of the redistribution in Western vs. Eastern Europe, between 2007 and 2014



Source: Authors' calculations based on EUROMOD H1.0+.

2.3 Decomposing changes in vertical redistribution

Changes in redistribution over time can result from both changes in the structure of the economy (i.e. market income inequality) and from active policy changes in tax and transfer systems. Decomposition methods based on counterfactual simulations can be used to distinguish between the two. To assess the impact of taxes and transfers on the changing size of redistribution, it is important to isolate the effect of active changes in tax-benefit policies, as opposed to changes due to shifts in the structure of the economy. Consider, for instance, a country with an aging

population and a pension system that provides pension benefits that are of equal amount to all old people. Over time, a larger proportion of people will receive pensions and, if both the tax and the pension systems remain unchanged, inequality of disposable incomes will go down and the redistributive effect of the system will appear to be increasing. This redistribution is "automatic" and depends on the change in the age structure of the population, instead of an active change in the rules of taxation or of the benefits. Similar examples include the protection provided by automatically inflation-adjusted minimum wages or transfers.

Using the Bourguignon, Ferreira and Leite (2008) decomposition method, the change in the size of redistribution over time can be expressed in two components. The first component captures the change in market income inequality, "discounted" by the change in disposable income that would have occurred if the tax-benefit system had remained constant, and only market income had changed over time. This first component therefore isolates the effects of market forces on the change in redistribution. The second component captures the change in the redistribution that would have occurred if only the tax-benefit system had changed over time, keeping constant the level of market income observed at the end of the period.

To implement the decomposition, we first define the Gini coefficient as a function of the distribution of market income (1), and the Gini coefficient as a function of the distribution of disposable income (2).

$$Gini_t^{market} = G\left(f\left(y_t^{market}\right)\right) \quad (1)$$

$$Gini_t^{disposable} = G\left(f\left(y_t^{disposable}\right)\right) \quad (2)$$

Disposable income is, itself, a function of market income and the tax and transfers system at a given point in time, so (2) can be rewritten as a function of the joint distribution of market income and the tax and transfer system, TB_t, as follows.

$$Gini_t^{disposable} = G\left(f\left(y_t^{market}, TB_t\right)\right) \quad (3)$$

The change of the redistribution over time can be expressed as the change in the Gini coefficient of market income over time, net of the change in the Gini coefficient of disposable income over time:

$$\Delta RS_{t_1-t_0} = \left[Gini_{t_1}^{market} - Gini_{t_0}^{market}\right] - \left[Gini_{t_1}^{disposable} - Gini_{t_0}^{disposable}\right] \quad (4)$$

We can then replace (1) and (3) into (4) to further decompose the change in the Gini coefficient of disposable income over time.

$$\Delta RS_{t_1-t_0} = \left[G\left(f\left(y_{t_1}^{market}\right)\right) - G\left(f\left(y_{t_0}^{market}\right)\right)\right] - \left[G\left(f\left(y_{t_1}^{market}, TB_{t_1}\right)\right) - G\left(f\left(y_{t_0}^{market}, TB_{t_0}\right)\right)\right] \quad (5)$$

Making use of counterfactual simulations, we can further decompose the change in the Gini coefficient of disposable income over time into three components:

$$\Delta RS_{t_1-t_0} =$$

$$\left[G\left(f\left(y_{t_1}^{market}\right)\right) - G\left(f\left(y_{t_0}^{market}\right)\right)\right]$$

$$-\left[G\left(f\left(y_{t_1}^{market}, TB_{t_0}\right)\right) - G\left(f\left(y_{t_0}^{market}, TB_{t_0}\right)\right)\right] \quad \text{Market component}$$

$$-\left[G\left(f\left(y_{t_1}^{market}, TB_{t_1}\right)\right) - G\left(f\left(y_{t_1}^{market}, TB_{t_0}\right)\right)\right] \quad (6) \quad \text{Policy component}$$

The first term in squared brackets corresponds to the change in the Gini coefficient of market income. The second term corresponds to the difference in the Gini coefficient of disposable income due to changes in market income – that is, the change in the Gini coefficient of disposable income that would have been observed if the tax and transfer system had remained unchanged and only market income had changed between the two periods. Together, these two terms form the market component, capturing the two channels through which a change in market income affects the degree of redistribution. The third term corresponds to the change in the Gini coefficient of disposable income due to changes in the tax and transfer system – that is, the change in the Gini coefficient of disposable income that would have been observed if market income had remained unchanged and only the tax and transfer system had changed between the two periods. Note that this decomposition of the change in the Gini coefficient of disposable income can be done using two sets of counterfactuals – one in which the market component is calculated using the system in t_1 and the system component using market income in t_1, and another one in which the market component is calculated using the system in t_0 and the system component using market income in t_0. The results of the decomposition using either of these sets of counterfactuals will be different since this decomposition method is path dependent. Details on how to obtain counterfactual distributions using the microsimulation model EUROMOD are also described in Annex B.

Note that while the policy component measures the share of redistribution that is due to active policy changes, it does not necessarily imply an explicit intention to redistribute. For example, a country may have to reduce the fiscal deficit – this is the intentional policy objective – and to do so it increases the tax rates. This may generate a redistributive effect, although this was not the primary objective of the policy change.

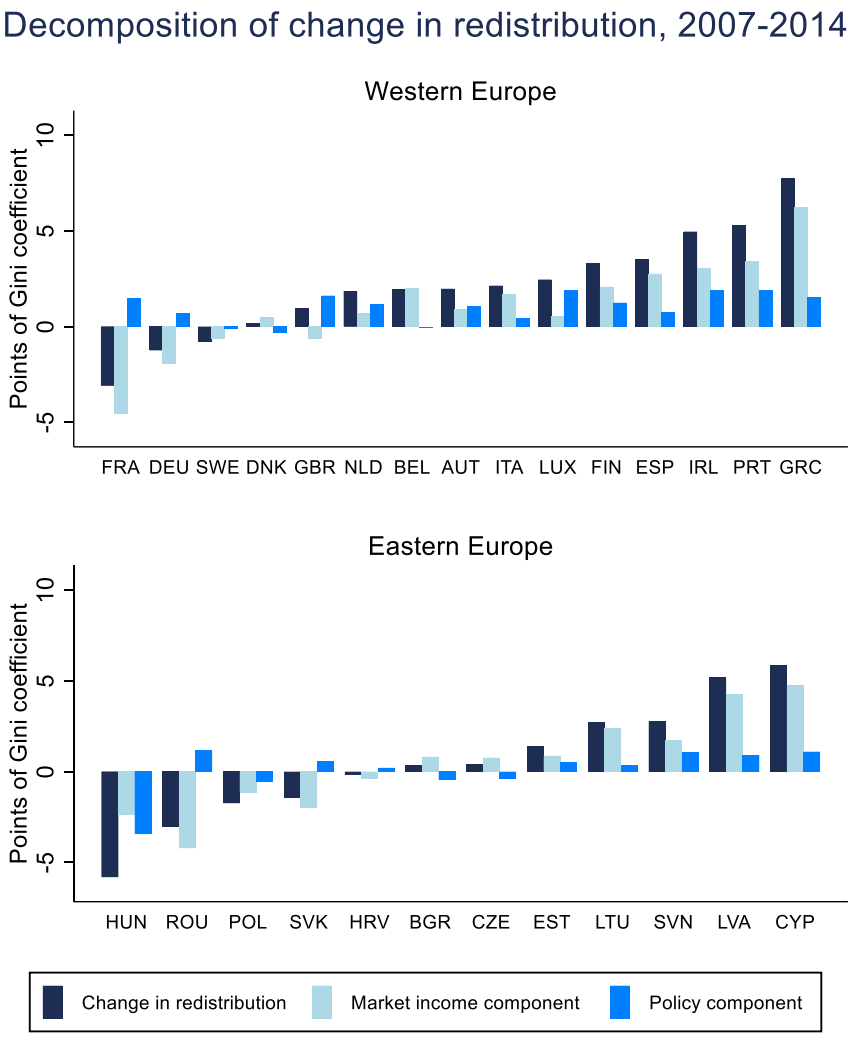
2.4 Decomposition results: general trends

Changes in market incomes, rather than policy changes, were the main drivers of the increase in redistribution in most EU15 countries between 2007 and 2014 (Figure 4). Yet, policy changes contributed to lowering inequality in most countries, with the exceptions of a few traditionally generous welfare systems such as Denmark, Sweden and Belgium. The largest increase in redistribution purely due to changes in tax-benefit policies can be found in Ireland, where changes in taxes and transfers reduced market income inequality by almost 2 Gini points, followed closely by Luxembourg, Portugal and the United Kingdom. In most of the remaining

countries, the contribution of active changes in taxes and transfers to the degree of redistribution lies between 1 and 2 Gini points. In the majority of countries, changes in the market component contributed to a reduction in inequality between 2007 and 2014. This development can at least partly be attributed to lasting negative effects of the financial crisis on incomes. However, some countries also experienced an increase in market-driven inequality. In some countries such as the United Kingdom, changes in tax-transfer policies compensated for the inequality-increasing effects resulting from changes in the market income component, while in other countries (e.g. France) policies only partially compensated for the widening income distribution driven by market forces.

In contrast to the EU15, changes in tax and transfer policies in the EU13 countries, i.e. the new EU member states, reduced the degree of redistribution in one third of the countries (Figure 4), with positive effects on average displaying a lower magnitude than in the EU15. In the majority of countries, the total degree of redistribution increased, predominately driven by changes in the market income component. The change in total distribution oftentimes largely exceeded the change in redistribution due to policy changes, with governments not fully compensating the decline in redistribution driven by the structure of the system. For example, while Romania displayed the largest increase in redistribution due to changes in taxes and transfers, this was not sufficient to compensate for the decline in redistribution driven by changes in the underlying structure of the system. In a few countries, including Hungary, and, to a minor extent, Poland, Bulgaria and the Czech Republic, changes in tax and transfer policies even reduced the amount of redistribution.

Figure 4. Decomposition of changes in redistribution



Source: Authors' calculations based on EUROMOD H1.0+.

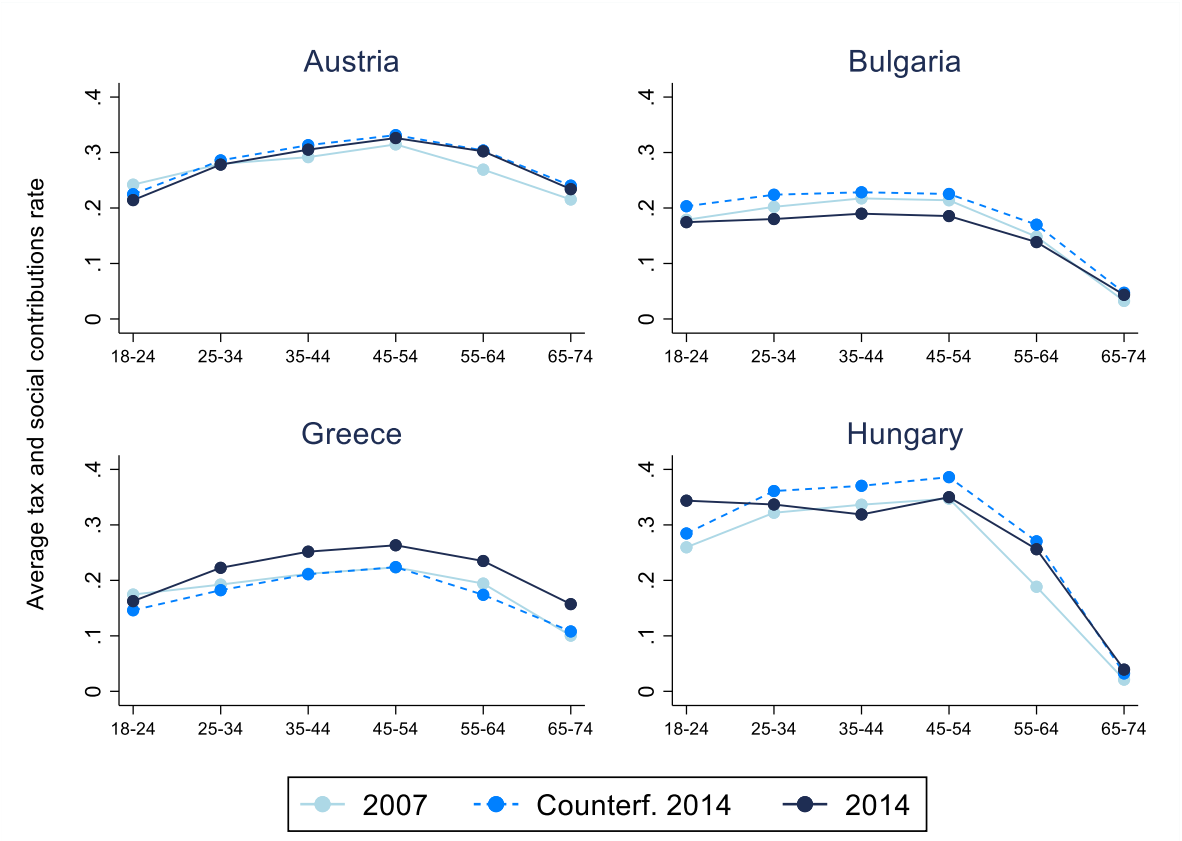
3. Assessing horizontal redistribution

The previous section assessed tax and transfer systems from a vertical point of view, analyzing the redistribution of income from the rich to the poor. The overall patterns are heterogeneous: while most of Southern and Western European countries saw an increase in redistribution, several countries in Central and Eastern European saw reductions in the size of redistribution not explained by changes in market income but by active changes in the tax and transfer system. These patterns may not necessarily hold when analyzing how these systems redistribute across groups of the population defined by non-monetary dimensions, instead of how they redistribute between rich and poor. This horizontal rather than vertical analysis is the focus of this subsection.

3.1 Horizontal redistribution across age groups

The generational dimension of the tax and transfer system has been receiving much attention in many European countries' public debate. As growth has slowed down following the financial crisis and the prevalence of precarious employment increased in many countries, income levels of younger generations have frequently taken a hit. At the same time, the income levels of older generations have been much more stable (Bussolo et. al, 2018). Hence, it is of high relevance to investigate how the tax and transfer systems perform across age groups and how they evolved over the past years. Figure 5 contrasts developments of tax systems across age groups, showing the average income tax and contribution rate by age groups in a selection of countries that representing the different trends around Europe.

Figure 5. Different age-tax profiles across Europe:
Average tax and social contribution rate by age group, 2014



Source: Authors' calculations based on EUROMOD H1.0+.

Note: the light blue line indicates the average tax and social contributions rate, calculated as a share of gross income, for 2007. The navy solid line indicates the same variable for 2014. The blue dashed line indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

Two different age-tax profiles emerge in Figure 5. On the one hand, the average tax rate in Austria and Greece follows the typical hump shape of income over the life cycle. As individuals age, they acquire experience and their income level increases, reaching its peak around 50. After retirement, when incomes typically decrease, the average tax rate also follows. This parallel behavior of incomes and average tax rate is characteristic for progressive tax systems: richer age groups face higher tax rates than poorer age groups. On the other hand, a different kind of system is seen in Bulgaria and Hungary. The average tax rate is quite flat and increases only slightly along the life cycle for the groups that are in the working age (between 18 and 55 years). The average tax rate declines only for older age groups upon the beginning of retirement. In this sense, the lowest income age groups, the very young and the very old, are treated differently. Although not a regressive system - the average tax rate does not decrease as income levels increase - this system does treat low income people differently depending on their age-dependent income type. Young individuals pay an average tax rate similar to the one of the richest age group, and pay several times as much as the oldest group. It is interesting to note that Austria and Bulgaria have, from a vertical point of view, a very similar market income inequality, but very different disposable income inequalities. The smaller vertical redistribution observed in Bulgaria with respect to Austria is reflected horizontally in the uneven treatment of the poorest age groups: whereas in Austria the poorest age groups pay, on average, a lower and similar tax rate, in Bulgaria only the oldest, poor age group pays a low tax rate. This non-progressive taxation across age group can be a source of distributional tension. In Figure A.1 in the Annex, we show age-tax profiles of 28 European countries, and a clear divide emerges: the progressive profile of Austria and Greece is found in most of the Northern, Southern and Western European countries. The non-progressive tax profile of Bulgaria and Hungary is common to the Baltics and Central and Eastern European countries.

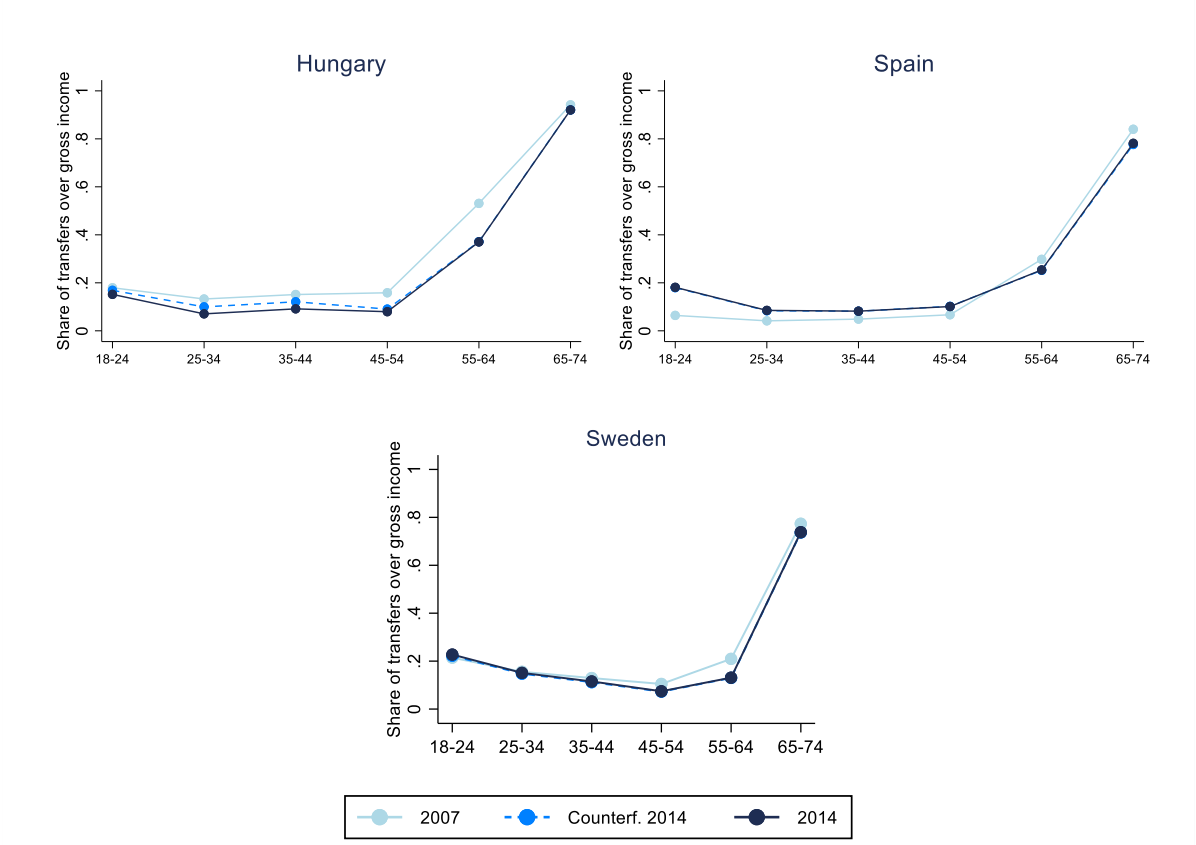
One potential explanation for the difference in the age-tax profile between Southern and Western Europe on the one hand, and Central and Eastern Europe on the other hand may not lie in the nature of the systems but in the profile of market income: in Central and Eastern European countries the differential between the income of the very young and the middle aged is smaller than in Southern and Western Europe (Bussolo et al., 2018). In the sense, the small difference in the average tax rate between the young and the middle aged arises naturally even in a system with an ex-ante progressive tax system. Decomposing the changes over time helps to better understand the underlying differences. For once, while in 2014, the average tax rate in Bulgaria remained rather flat between age 18 and 45, it used to increase in 2007. The flattening of the tax profile is mainly resulting from tax reforms: had the system not changed, tax rates would have increased for all age groups, as the counterfactual simulation shows. Nevertheless, the reduction was stronger for middle aged groups than for the youngest, whose 2014 tax rate roughly remained at the 2007 level, whilst it dropped by close to 5 percentage points for those aged 35 to 55. In the case of Hungary, the flat age-tax profile emerged after the implementation of the flat tax on personal income. This resulted in an increase in the average tax rate of those aged 18 to 24 and a reduction in the tax rate for those aged 45 to 55.

The cases of Bulgaria and Hungary are not the only ones in Europe: in Latvia, Lithuania and Poland active changes in the tax system also resulted in a less progressive profile. In this sense,

Central and Eastern European countries have systems which relatively favor the old because of differences in relative incomes and the changes in the system have increased these tendencies. Thus, although the income situation has developed relatively benevolent for the younger generations of Central and Eastern Europe, the governments have been less generous.

Other forces are at work in Austria and Greece. Greece has been subject to progressive policy changes. Average tax rates increased for all age groups between 2007 and 2014, but particularly for the middle aged. The very young saw almost no increase in their average tax rate, whereas the very old saw an increase that put them at the same level as the very young. This is mainly attributable to active changes in the tax system. Had it not been for changes in the system, the average tax rate would have decreased or at least remained stable in 2014. Other countries that observed a similar pattern as Greece – an increase in the average tax rates in a progressive fashion – were Cyprus, Portugal and Spain. Considering that in Southern and Western Europe the income levels of the younger generations fared particularly badly with respect to the middle aged and the old, these changes in the tax system have partly compensated for the negative market outcomes. In contrast, the Austrian tax system has not seen substantial changes between 2007 and 2014. While older individuals have been facing increasing tax rates over time, this development is driven by increasing market incomes, possible attributable to increased labor market participation of older generations. Other countries such as the United Kingdom and Germany instead faced lower tax burdens throughout the age distribution, while the burden of the oldest age group remains rather constant.

Figure 6. Age-transfer profiles across Europe: Average share of transfers (pensions and benefits) over gross income by age group, 2007-2014



Source: Calculations based on EUROMOD H1.0+.

Note: the light blue line indicates the average tax and social contribution rate, calculated as a share of gross income, for 2007. The navy solid line indicates the same variable for 2014. The blue dashed line indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

So far, the analysis has focused only on taxes and social contributions. Figure 6 instead presents the age profile of incidence of transfers (expressed as a share of gross income) for three examples, Hungary, Spain and Sweden. The patterns are expected to show the highest incidence for the oldest age group, whose income is almost entirely composed of transfers, particularly pensions. Some changes over time can be seen, namely an increase in the incidence among the youngest age group in Spain and a decrease among the older age groups in the three countries, but in all the cases they seem to be entirely explained by changes in market income. The counterfactual simulation - for which the transfer system of 2007 is replicated on top of the market income structure of 2014 - coincides almost entirely with the actual scenario observed in 2014. Only in Hungary did changes in the transfer system explain a small part of the decrease in transfer incidence observed for those in the working age. The same pattern as in these three countries – changes in the incidence of transfers explained almost entirely by market forces – is observed throughout Europe.

The overall picture that emerges from the analysis across age groups in Europe is twofold. On the transfer side, the changes in incidence appear to be explained almost entirely by the automatic reaction of the system to changes in market income. In a context of decreasing income growth among younger generations in Southern and Western Europe, the incidence of transfers automatically increases even if transfers do not increase in absolute values. Little changes can be seen in regions where younger generations' incomes have done fairly better – like Northern or Central and Eastern Europe. No active changes in the parameters of the transfer system appear to have significantly contributed to changes in the transfer incidence. On the tax side, however, there have been diverging trends: countries in Southern and Western Europe have actively changed the tax system in a progressive way, by lowering - in relative terms - the taxes for the very young and the very old. Thereby, the system alleviates a potential source of distributional tension. On the contrary, in Central and Eastern Europe, active changes in the system have hurt lower income groups, particularly the young – in some cases, even by increasing the average tax rate when, absent any change of the system, market forces would have induced a decrease. Flat tax systems, prevalent in that region of Europe, appear to be particularly regressive when looking at them from a horizontal, generational point of view, potentially creating a source of distributional tension.

3.2 Horizontal redistribution across occupations

Another horizontal dimension which is relevant is the occupational one. As de-routinization and job polarization are present across Europe, particularly in Southern and Western Europe, it is of interest to analyze how the tax and transfer system has reacted to these phenomena. In particular, market forces have worsened the earnings of those in non-routine, manual task intensive occupations, whose share of employment has increased (Bussolo, Torre and Winkler, 2018), and also of those in routine task intensive occupations, whose share of employment has decreased. Meanwhile, the relative wages paid to those in non-routine, cognitive task intensive occupations have increased.

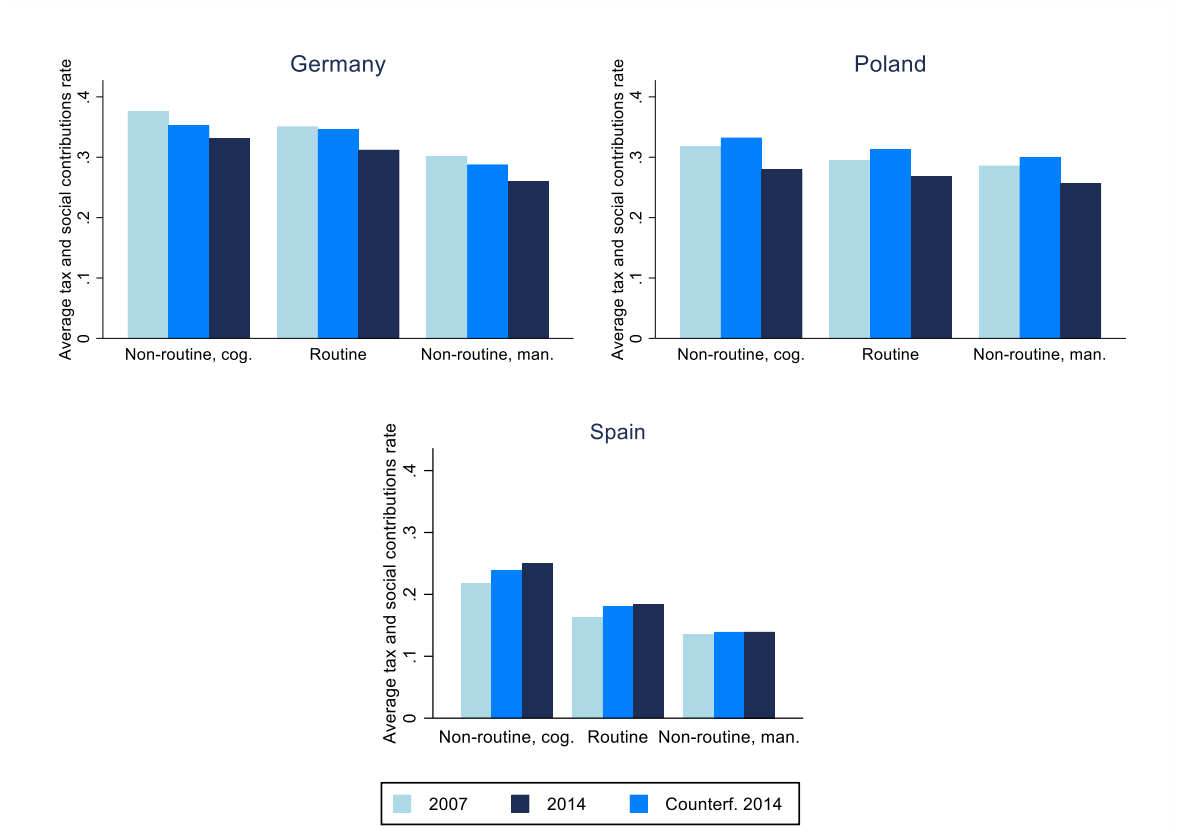
Figure 7 presents the average tax and social contributions rate paid by each of three occupational groups in three EU countries: Germany, Poland and Spain. In all these countries, the main trends on occupational change - polarization of occupations and a regressive change in wages - were present (see Bussolo, Torre and Winkler, 2018, for a detailed analysis of occupational change and its impact on earnings in these three countries). However, each country represents one of the different patterns arising across Europe.[7]

From a static point of view, the occupation-tax profiles share a common, progressive pattern: the lowest paid occupations - non-routine, manual task intensive ones - pay the lowest average tax rate, whilst the highest paid occupations - non-routine, cognitive task intensive ones - pay the highest average tax rate, with the routine task intensive occupations lying in between. However, the slope of this pattern is different: whereas in Germany and Spain, the difference between the

[7] See Figure A.3 in the Annex for an overview of all countries under consideration.

highest and the lowest average tax rate was around 10 percentage points in 2014, the same difference in Poland was closer to 4 percentage points, thus being in line with the relatively flat tax profile of that country.

Figure 7. Different reactions of the tax system to job polarization: Average tax and social contribution rate by occupational group, 2007-2014



Source: Authors' calculations based on EUROMOD H1.0+.

Note: Occupational groups are the following: non-routine, cognitive task intensive occupations (ISCO 08 major groups 1, 2 3); routine task intensive occupations (ISCO 08 major groups 4, 7 8); non-routine, manual task intensive occupations (ISCO 08 major groups 5, 6, 9). The light blue bar indicates the average tax and social contributions rate, calculated as a share of gross income, for 2007. The navy color bar indicates the same variable for 2014. The blue bar indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

The evolution of the average tax rate over time reveals different patterns. In Germany, the average tax rate has slightly fallen for all three occupation groups, but more for the highest paid group with non-routine, cognitive task intensive occupations. This regressive change is, however, a combination of market forces going in one direction, thereby making tax rates converge across occupations and active changes in the tax system going in the opposite direction, leading to a divergence in tax rates. Had the system not changed, the average tax rate would have decreased the most for non-routine, cognitive task intensive occupations, with comparatively lower effects on routine task intensive and non-routine, manual task intensive occupations. Active changes in the tax system lead to a 3.3 percentage point reduction in average tax rate for

the routine task intensive occupations, a 2.8 percentage point reduction for the non-routine manual task intensive occupations, and a decrease in 2.2 percentage points for the non-routine, cognitive task intensive occupations. In this sense, the occupational groups negatively affected by job polarization, i.e. routine and non-routine manual occupations, appear to have been somewhat actively compensated to the point that their tax reduction was slightly larger than the one of the "winner" occupational group.

In Poland, the average tax rate has also decreased for the three occupational groups. As in Germany, we see the largest decrease for those in non-routine, cognitive task intensive occupations, resulting in a tax rate convergence. In contrast to Germany, however, the counterfactual simulation shows that active policy changes fostered this convergence rather than compensating it: system changes resulted in a decrease of 5.3 percentage points in the tax rate of non-routine, cognitive task intensive occupations, a 4.5 percentage point decrease in the tax rate of routine task intensive occupations, and a decrease close to 4.3 percentage points in the tax rate of non-routine, manual task intensive occupations. In this sense, non-routine, cognitive task intensive occupations are not also the "winners" of job polarization, but also they obtained the largest decrease in average tax rates. Rather than alleviating distributional tensions emerging from occupational change, the tax system in Poland appears to have fostered them.

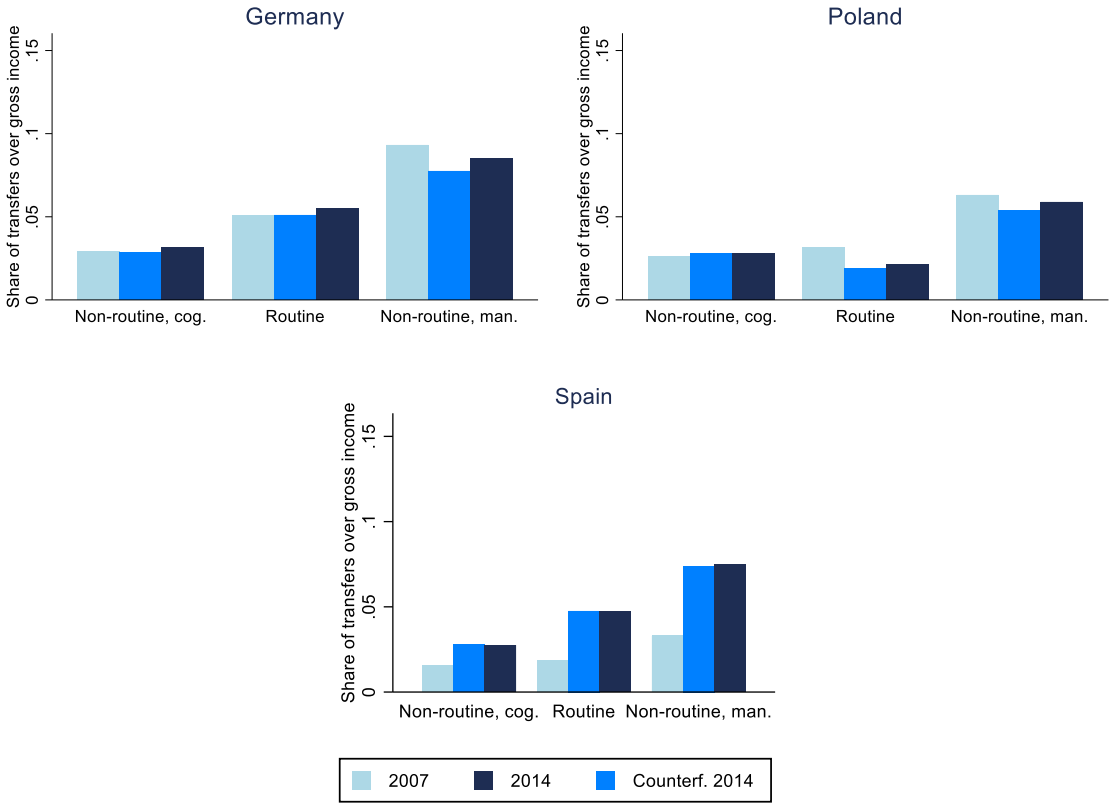
Lastly, the case of Spain reflects a mostly market driven, automatic reaction of the tax and transfer system. The average tax rate for non-routine, cognitive task intensive occupations increased by close to 2 percentage points between 2007 and 2014, and that of non-routine, manual task intensive occupations increased by a similar amount. The average tax rate faced by non-routine manual task intensive occupations remained virtually stable. Active changes in the tax system do not seem to affect the tax rate of the "losers" of job polarization, and only explain half of the actual increase in tax rates of non-routine, cognitive task intensive occupations – the "winners" of occupational change. Whilst the automatic reaction of the tax system appears to work in the direction of alleviating distributional tensions emerging from changes in the occupation structure in Spain, only little active change in the tax system has supported this.

Across Europe, these three different patterns of active positive compensation, active negative compensation and automatic compensation are replicated in many countries (see Figure A.3 in the Annex). Somewhat similar to Germany, active positive compensation is observed in Belgium and Finland, amongst others. Active negative compensation, such as in the case of Poland, occurs in Bulgaria and Hungary, for example. In the latter case, average tax rates were even raised for those in routine manual occupations, and fell for non-routine cognitive occupations. Lastly, those countries where, like in Spain, most of the change is explained by automatic reaction of the system are France, Romania and Estonia. Unlike the case of the horizontal, generational dimension, where a strong East-West divide was present, the scenario is more mixed with respect to the occupational structure.

The evolution of transfer systems over time, in contrast to the analysis across age groups, shows that, although often small, some policy changes have had an impact on different occupational groups (Figure 8). Given that the focus of this analysis is on people in employment, the magnitude of transfers relative to gross income is particularly small: within the whole sample of

EU countries, the highest values are seen for non-routine, manual task intensive occupations in Cyprus, the UK, France, Ireland and Estonia, where transfers make up to 14% of gross income. Over time, however, there have been slight differences across countries. In the case of Germany and Poland, policy changes to the transfer system increased the amount of transfers to workers in non-routine, manual task intensive occupations by close to one percentage point of their gross income. In the case of Spain, policy changes played no role in the observed increase in the share of transfer over gross income across all occupational groups. Instead, the entire change can be explained by the automatic reaction of the system in a context of changing market income.

Figure 8. Limited role of policy changes in the transfer system across occupations: Average incidence of transfers, 2007-2014



Source: Authors' calculations based on EUROMOD H1.0+.

Note: Occupational groups are the following: non-routine, cognitive task intensive occupations (ISCO 08 major groups 1, 2 3); routine task intensive occupations (ISCO 08 major groups 4, 7 8); non-routine, manual task intensive occupations (ISCO 08 major groups 5, 6, 9). The light blue bar indicates the average tax an social contributions rate, calculated as a share of gross income, for 2007. The navy color bar indicates the same variable for 2014. The blue bar indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

Most of the remaining countries in Europe have shown small, but still positive, policy-driven increases in the transfers for workers in routine task intensive and non-routine, manual task intensive occupations. In Cyprus, for instance, workers in non-routine, manual task intensive

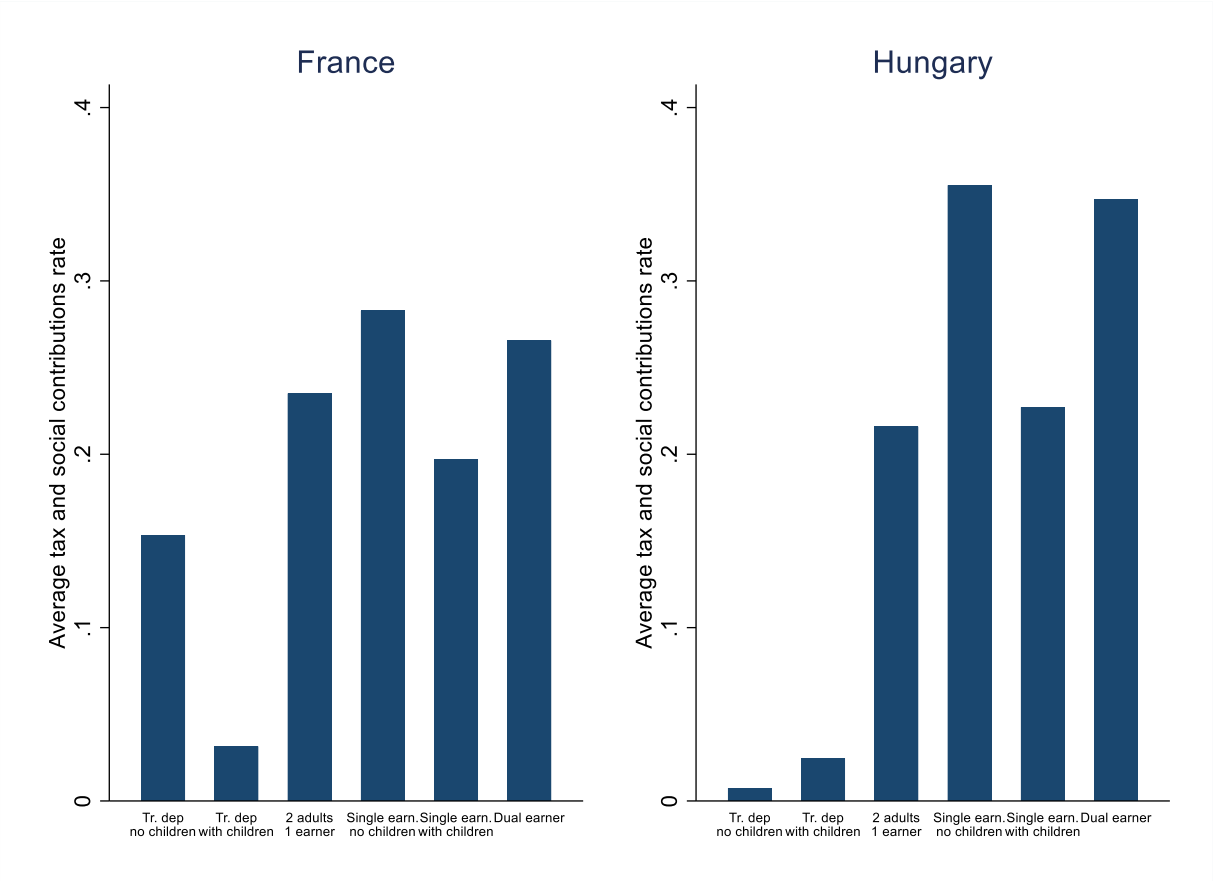
jobs experienced a transfer increase from 8% to 14% of their gross income between 2007 and 2014. Of this 6-percentage point increase, almost 4 points are exclusively explained by active policy changes in the transfer system. Policy-driven declines in transfers are only observed in Hungary and Ireland.

Overall, the picture that emerges from the analysis of the tax and transfer systems' across occupational groups is that the "losers" of job polarization – the shrinking routine task intensive occupations and the low paid non-routine, manual task intensive occupations –, if anything, are being partly compensated from the transfer side, but not so much by direct changes to the tax systems, which, in few cases, even increase the tax pressure on them more than for the "winners" of occupational change.

3.3 Horizontal redistribution across household types

The structural composition of the middle class in Europe has been changing: whereas the middle deciles of the income distribution have become more and more populated by pensioners, households with two earners are increasingly found in the top, and the traditional two-adult one-earner male breadwinner households are now mostly found in the bottom deciles. Moreover, single adult households with and without children are becoming more common (Bussolo et al., 2018). To the point that tax and transfer policies may benefit some income groups more than others, they may also benefit some type of households more than others. In this sense, it is relevant to analyze how the tax and transfer systems have affected households depending on their structure. In this sub-section, we analyze six exemplary types of households that cover on average around 80% of the population: i) those composed of adults entirely dependent on transfer income, without children; ii) those composed of adults entirely dependent on transfer income, with children; iii) those with two adults, one of them with labor market income and the other with no income, where the typical male breadwinner household model is found; iv) those with one adult earning labor income and children - the single parent case; v) those composed exclusively of one working adult, without children - single independent adults - and vi) those with two adults, both with labor market earnings - the dual earner households.

Figure 9. Different household-tax profiles across Europe: Average tax and social contributions rate by type of household, 2014



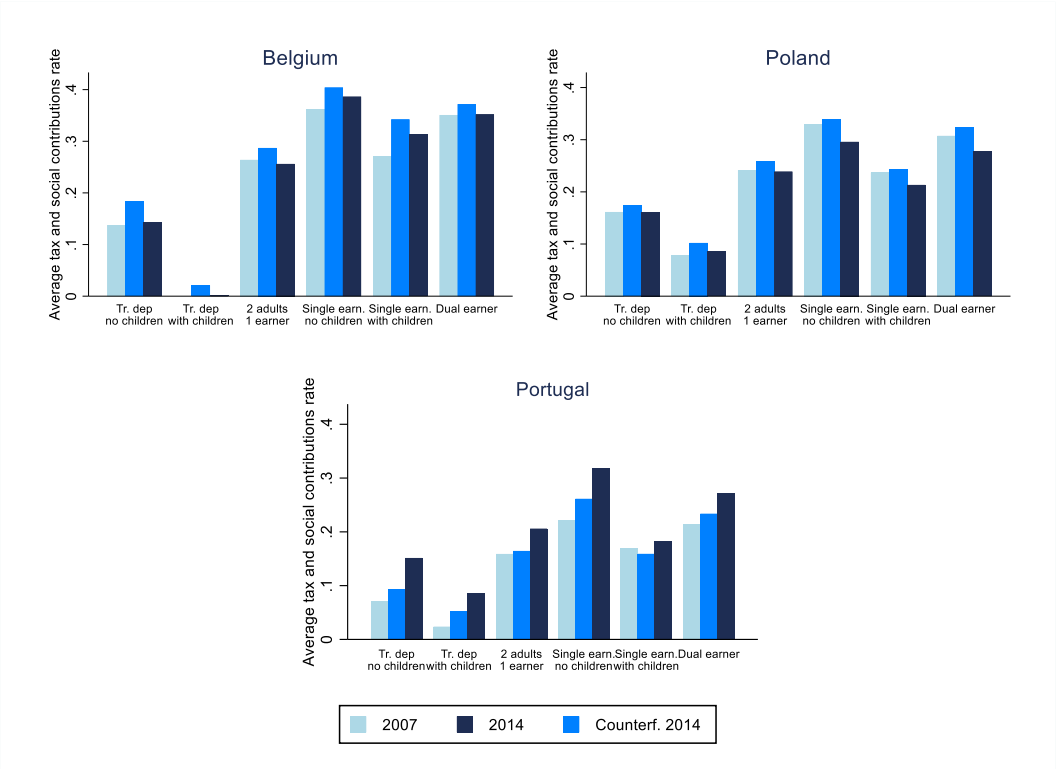
Source: Authors' calculations based on EUROMOD H1.0+.

Note: Household types are the following: "transfer dependent" as households with one or two adults, all of them with no labor market earnings and depending on transfers, distinguished between those with and without children; "two adult, one earner" households, composed by two adults of which only one of them has labor income, independently of their number of children ; "single earner" households, where only one adults is present, with labor incomes, distinguished between those with and without children; "Two adult, two earner" households are composed by two adults, both of them with labor market earnings, independently of their number of children.

Figure 9 shows two different profiles of tax rates across household types – the case of France, typical of most Western European countries, and the case of Hungary, characteristic of most Central and Eastern European countries. In France, the lowest average tax rate is found for transfer dependent households with children, while in Hungary, the lowest average tax rate is found for households without children who are entirely dependent on transfer income. In both countries, the highest tax rate is found among single earner households with no children. Among the households with labor income, those of single earners with children have the lowest average tax rate. These households are most vulnerable since there is only limited possibility of increasing household labor force participation, which is taken into account by the design of the tax profile. In single earner households with two adults, the second adult – mostly the woman – could enter the labor market and increase household income. Note however that the difference

between the average tax rates paid by the lowest taxed group and by the highest taxed group in France is close to 15 percentage points, whilst in Hungary it is more than 30 percentage points. As in the case of differences across age groups, the difference in these static profiles may not be due to system characteristics but, rather, to different underlying income profiles. Households dependent on transfer income could be poorer in Hungary than in France, and this may be a reason for the difference in average tax rates.

Figure 10. Three examples of changes in average tax rate across household types: Average tax and social contributions rate by household type, 2007-2014



Source: Authors' calculations based on EUROMOD H1.0+.

Note: The counterfactual scenario corresponds to the average rates that would have applied to each type of household in 2014 had the tax and transfer system been the same as in 2007.

Depicting the evolution of the household-tax profile over time, Figure 10 provides more information on the drivers of such static differences. We focus on three European countries, Belgium, Poland and Portugal, which show a similar profile in 2007, but differing changes over time. In both 2007 and 2014, average tax rates were lowest for transfer dependent households with children, followed by transfer dependent households without children. Yet, 2014 tax rates were on average higher than the counterfactual in Portugal, and lower in Belgium and Poland. Counterfactual simulations show, however, that tax systems changed differently in these countries. In the case of Belgium, active changes in the tax system benefited transfer dependent households the most, whose tax rates would have been 2 to 4 percentage points higher had the system not changed. In the case of Portugal, these types of households, particularly those without

children, were hit the worst by changes in the tax system: 6 out of the 8 percentage points of the increase in the average tax rate are explained by active changes in the tax system. In the case of Poland, dual earner households saw the biggest relative reduction in tax rates: had the system not changed, their average tax and social contributions rate would have from around 31% in 2007 to over 32% in 2014, but system changes brought it down to almost 28%. Transfer-dependent households benefitted from a system-induced decrease in their tax rate by close to two percentage points, while the one for single-earner households without children, was three percentage points. Similar to Poland, dual-earner households primarily benefitted from tax system changes in Bulgaria, the Czech Republic, and the United Kingdom.

With respect to the analysis of transfer system, the evidence presented in Figure A.6 in the Annex shows that, in addition to transfer dependent households, transfers represent a bigger share of gross income for households with one earner and additional members, either other adults or children, than for households with two earners or with one earner and no other members. Thus, as expected, household facing a bigger burden - in the sense of having only very few members bringing money from the labor market - are the ones where transfers have a high incidence. This profile, common to most countries, seems to not have changed considerably over time.

4. Conclusion

Overall, inequality across subgroups of the population, redistribution and the adequacy of the tax and transfer system are widely debated topics in the European Union. Using the comparative tax-benefit microsimulation model EUROMOD, this paper assesses redistribution in European countries, decomposing changes in redistribution into those driven by changes in the distribution of market incomes and those driven by changes in the tax and benefit system. While developments varied across countries, the majority of EU member states have experienced an increase in overall redistribution between 2007 and 2014. While this was primarily driven by changing market incomes, changes in the tax-benefit systems also played an important role, especially in Western European countries. In particular, some Eastern European countries also experienced a decline in the degree of redistribution, possibly leading to distributional tensions.

In a second step, we contrast developments across population subgroups and separately assess the incidence of taxes and transfers over time. For once, the results show that in Southern and Western Europe, both automatic stabilization effects and active changes in the tax system have alleviated the burden on younger generations, who have been hit the hardest following the financial crisis. In contrast, active changes to the tax and benefit system, leading to a flatter tax profile, have increased intergenerational distributional tensions in many Central and Eastern European countries.

This East-West divide is less perceptible in case of an analysis across occupations. Some countries, such as Germany, have actively compensated for job polarization, resulting in comparatively strong declines in tax rates for those in non-routine manual occupations. Tax-benefit reforms in other countries, such as Poland, have predominately favored individuals in non-routine cognitive occupations who benefit from job polarization. In contrast, many other

countries have not seen cross-occupational changes in the tax and benefit system. Instead, tax incidence is only driven by changing market incomes.

Third, we also assess developments across household types. Most countries have witnessed policy changes that lead to increasing transfers in transfer-dependent households, alleviating distributional tensions. Policies vary much more once households with income earners are considered. Particularly in Eastern Europe, many countries have actively lowered the tax burden on single and dual earner households, i.e. the households with traditionally large tax burdens. In contrast, tax burden increases are most often observed in countries affected by the financial crisis, such as Greece and Portugal.

Our results have important policy implications. In the public debate, much of the discussion is about vertical redistribution – for example about the magnitude of the top marginal tax rate. Our results show that changes in tax benefit policies in Europe over the last decade also affected horizontal inequalities. Especially given that market incomes developed differently for different socio-economic groups, this might help explaining the recent tensions and worries about increasing inequalities and injustices in Europe. Future research should analyze these connections more carefully.

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Figure A.1 Incidence of Tax and Social Security Contributions, by age group

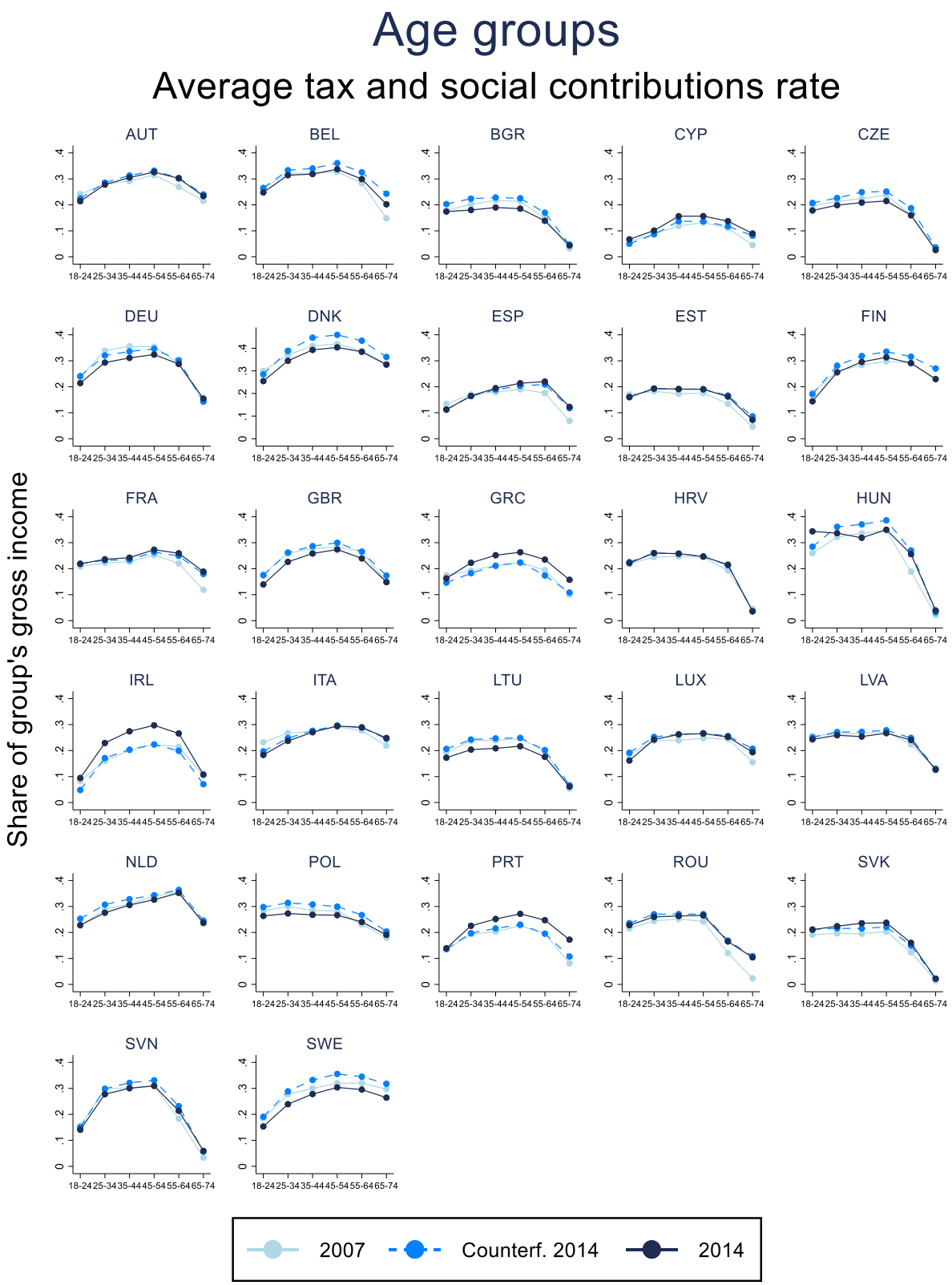


Figure A.2 Incidence of Transfers, by age group

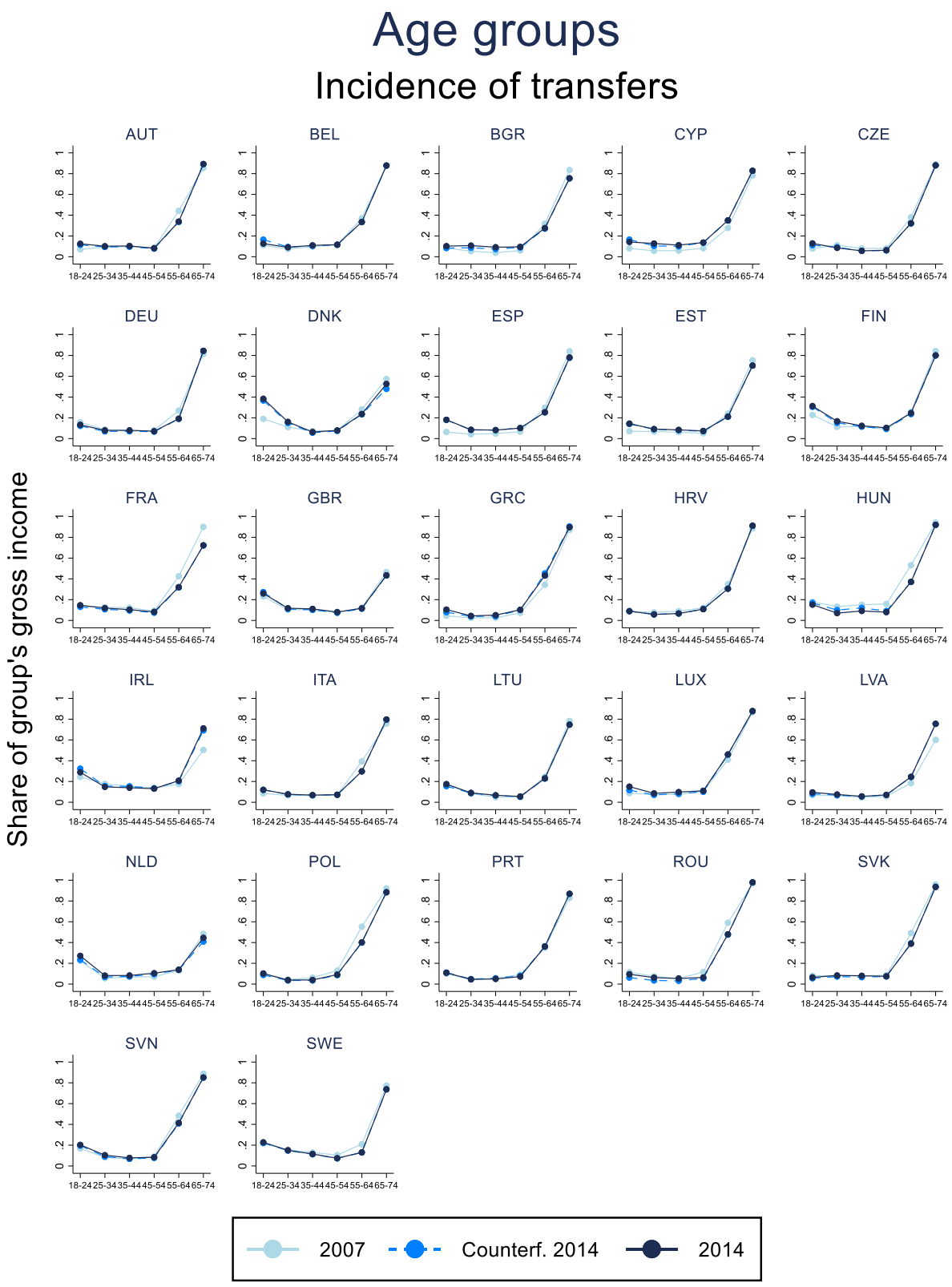


Figure A.3 Incidence of Tax and Social Security Contributions, by occupational category

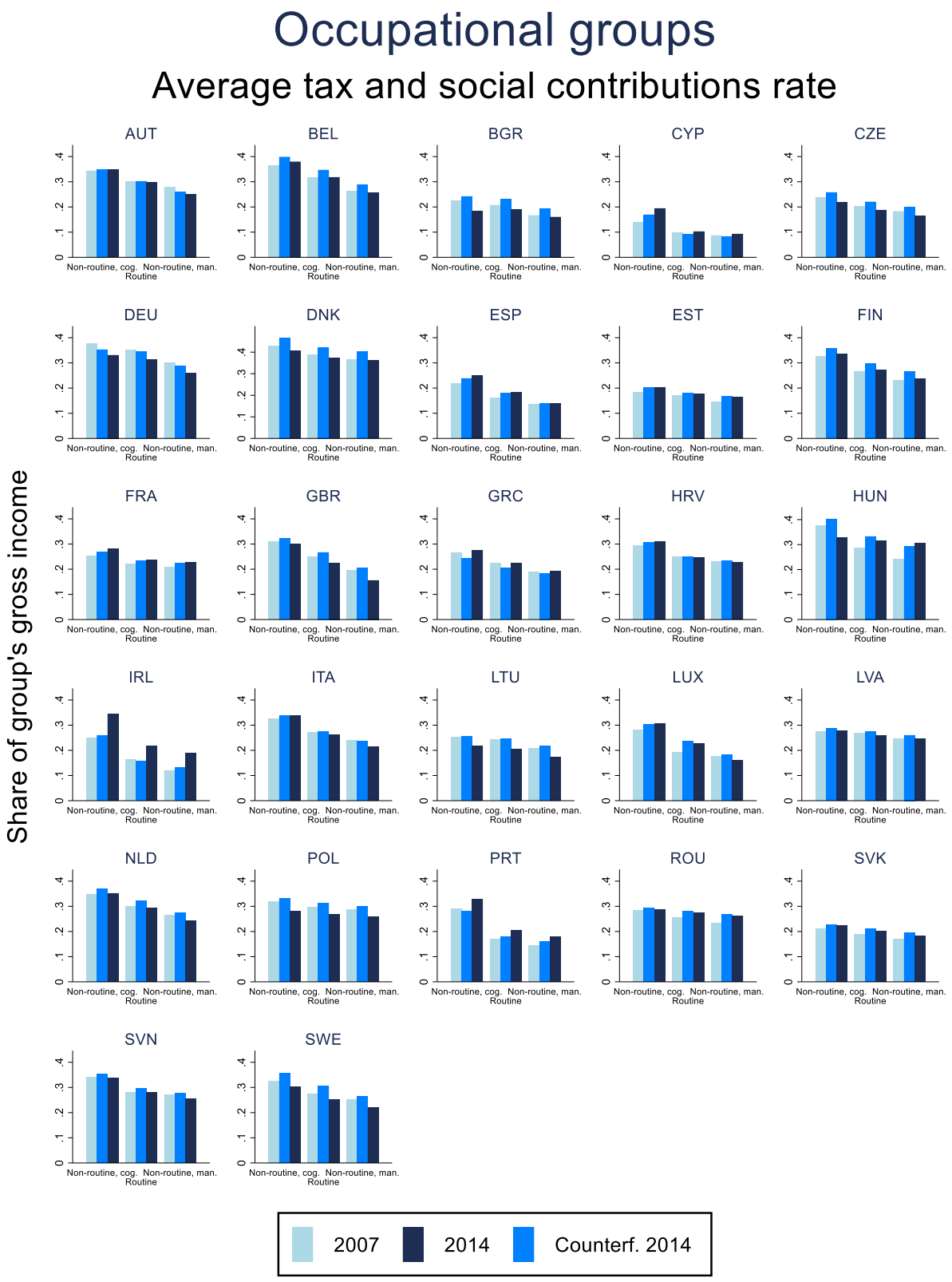


Figure A.4 Incidence of Transfers, by occupational category

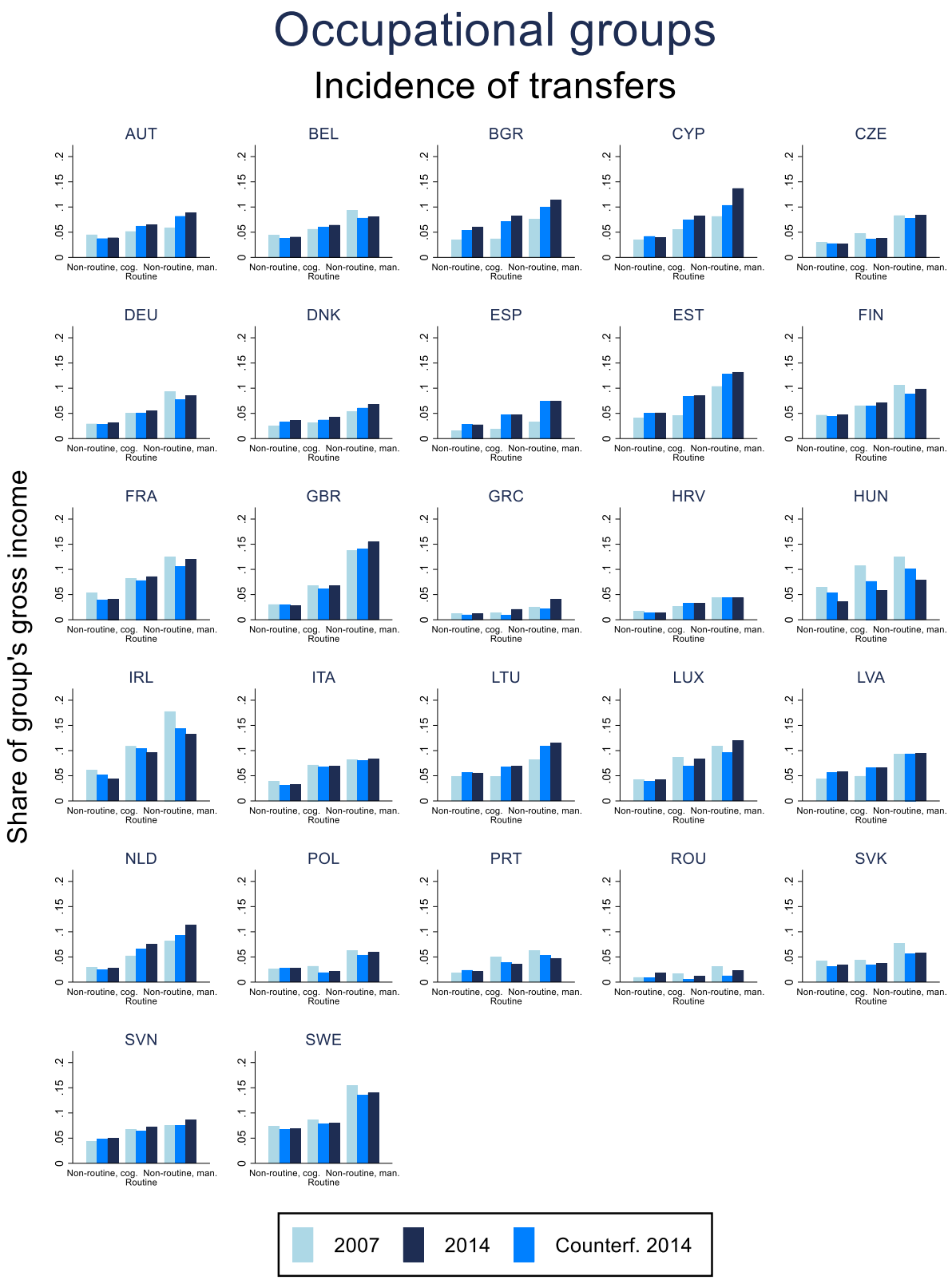
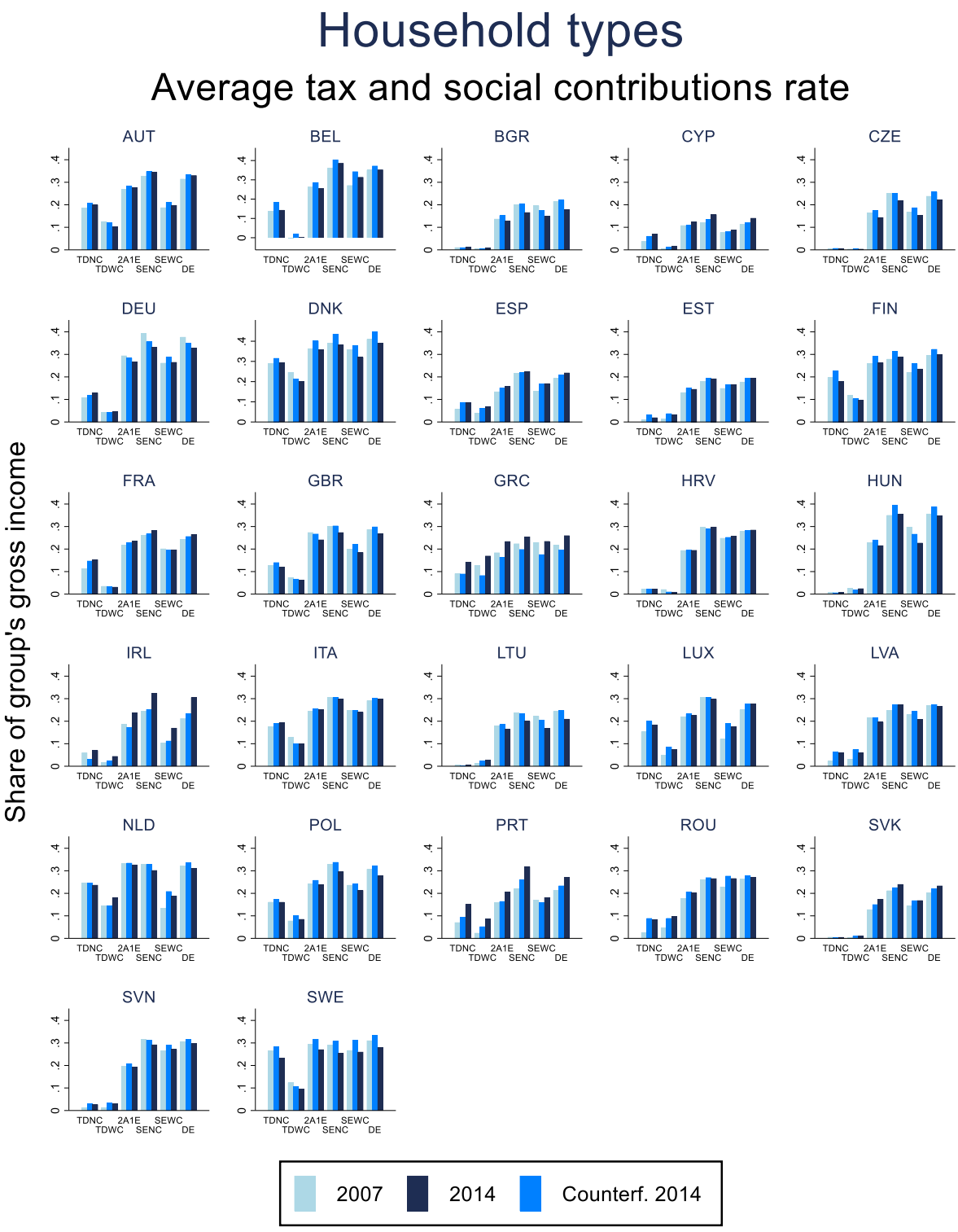
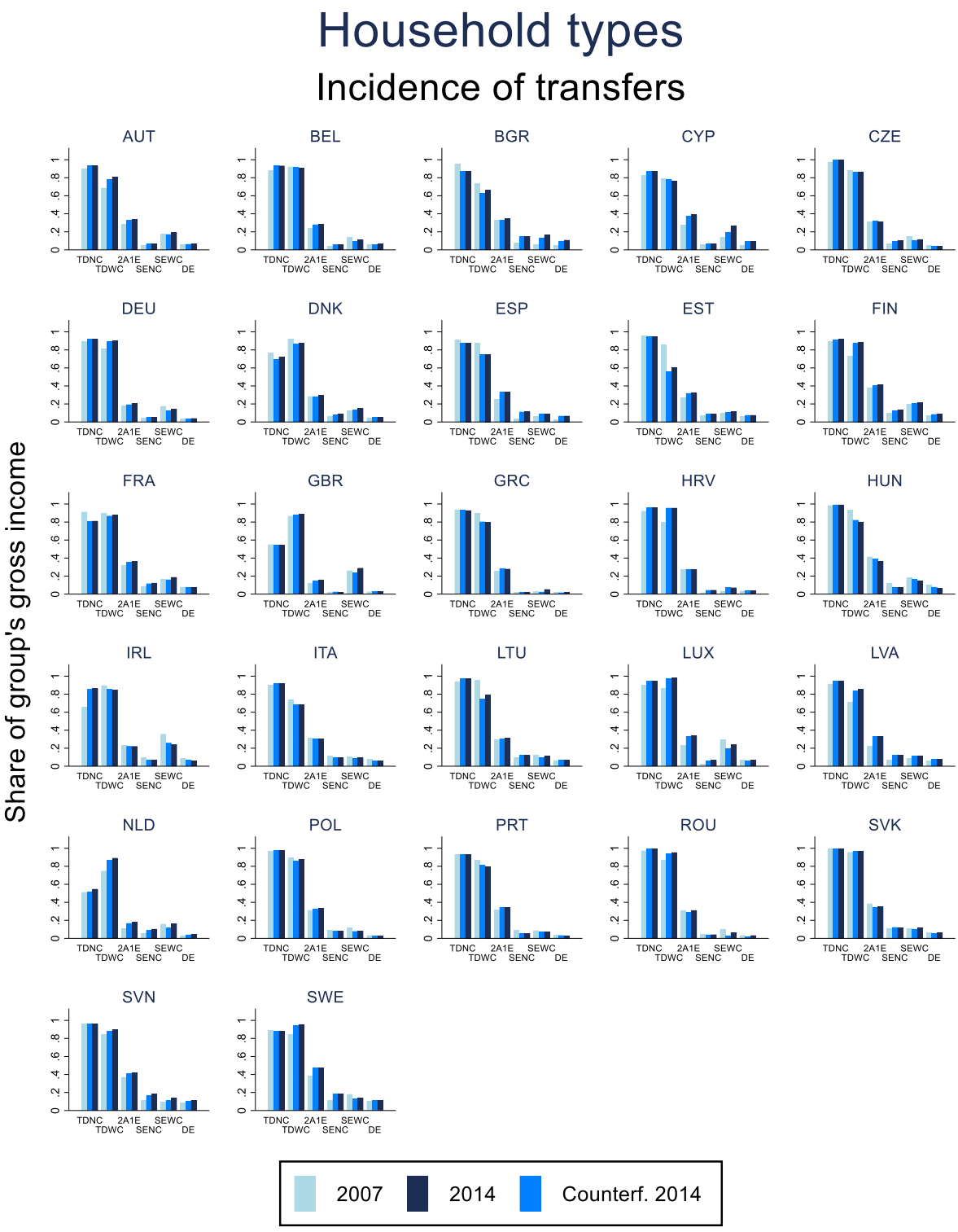


Figure A.5 Incidence of Tax and Social Security Contributions, by household type



Note: TDNC = Transfer dependent, no children ; TDWC = Transfer dependent, with children ; 2A1E = 2 Adults, 1 earner ; SENC = Single earner, no children ; SEWC = Single earner, with children ; DE = Dual earner

Figure A.6 Incidence of Transfers, by household type



Note: TDNC = Transfer dependent, no children ; TDWC = Transfer dependent, with children ; 2A1E = 2 Adults, 1 earner ; SENC = Single earner, no children ; SEWC = Single earner, with children ; DE = Dual earner

ANNEX B
The EU tax-benefit microsimulation model EUROMOD

The analysis of the change in redistribution over time included is based on the EU-wide tax-benefit static microsimulation model EUROMOD. EUROMOD simulates for EU-28 countries universal and targeted cash benefits, direct taxes and social insurance contributions, based on the tax-benefit rules in place in each country, and information available in underlying input datasets. The components of the tax-benefit systems that cannot be simulated (e.g. those depending on prior contributions or unobserved characteristics) are taken directly from the data along with information on original incomes. The model has been validated both at micro and at macro level and tested in numerous applications, and currently represents a consolidated tool widely used by both policy makers and academics for distributional analysis of taxes and transfers, as well as for the simulation of policy changes, within and across EU countries (for a comprehensive review, see Sutherland and Figari (2013). Input data are typically harmonized based either the EU-SILC UDB, or national EU-SILC surveys. For the UK, the Family Resources Survey (FRS) is used. Details on which taxes and transfers are simulated, and how, and which are taken from the data, are available for each country in EUROMOD Country Reports: these Reports are updated on a yearly basis, and include also relevant information on macro-validation statistics (e.g. to which extent taxes and benefits included in the model match aggregate administrative data on benefits expenditure and revenues from direct taxes).

EUROMOD enables to compute the disposable income of individuals under different scenarios, taking account of the operation of tax-benefit systems and the way these interact with market incomes and personal or household characteristics. In this chapter, the underlying micro data come for almost all countries from EU-SILC 2015 and EU-SILC 2008[8]. This implies that the income reference years are 2014 for the latest period of the analysis, and 2007 for the earliest period considered. By the same token, the latest tax-benefit system considered corresponds to 2014, while the earliest corresponds to 2007. In the EUROMOD jargon, 2014 and 2007 represent "baseline years", where reference income year and tax-benefits rules coincide, generating the best combination between input data, income year and tax-benefits systems. All simulations are carried out based on the tax-benefit rules in place on the 30th June of the given policy year.

To isolate the impact of the tax-benefits system on changes in disposable vs. market income over time, we run the following counterfactual exercise. Assume that $y_t^{disposable}$ is the distribution of disposable income in year t. We obtain a counterfactual distribution of disposable income in year

[8] For data limitation, the earliest income year is 2006 for France, 2008 for Malta and UK and 2011 for Croatia. The final income year is 2013 for Germany.

t, denoted by $y_{t,t-j}^{*\,disposable}$, that would have been obtained if the country had kept the same tax/benefits system in place as in year $t-j$.

The distribution of disposable income is defined by a function $h(\,)$:

$$y_t^{disposable} = h(y_t^{market}, TB_t, X_t),$$

where y_t^{market} are the market incomes, TB_t the tax-benefits rules, and X_t the population characteristics (socio-demographics, labour market, economic activity, etc.).

The counterfactual distribution is given by:

$$y_{t,t-j}^{*\,disposable} = h(y_t^{market}, TB_{t-j}, X_t).$$

That is, the counterfactual distribution is obtained by employing the tax/benefits system from $t-j$ to the market incomes and population characteristics in year *t*.[9]

[9] Additionally, we obtain a corresponding counterfactual distribution where the income year is kept constant instead of the tax/benefit system, i.e. $y_{t-j,t}^{*\,disposable} = f(y_{t-j}^{market}, TB_t, X_{t-j})$.