Vertical and horizontal redistribution: the case of Western and Eastern Europe

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Abstract

European countries have the world's most redistributive tax and transfer systems. Whilst 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. In a context where citizens may care not only about vertical redistribution but also about redistribution across non-monetary groups (Kanbur, 2018), the horizontal dimension of redistribution can become particularly relevant to explain citizens' discomfort with the status quo. With the use of EUROMOD, a microsimulation model of the tax and transfer system of European countries, we analyze the performance of 28 EU countries on redistribution across i) age groups; ii) occupational groups; iii) household types over the period 2007-2014. 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, whilst households with greater economic security have benefited from them. Our findings suggest that horizontal inequality is a dimension which policy makers should take into account when reforming tax and transfer systems.

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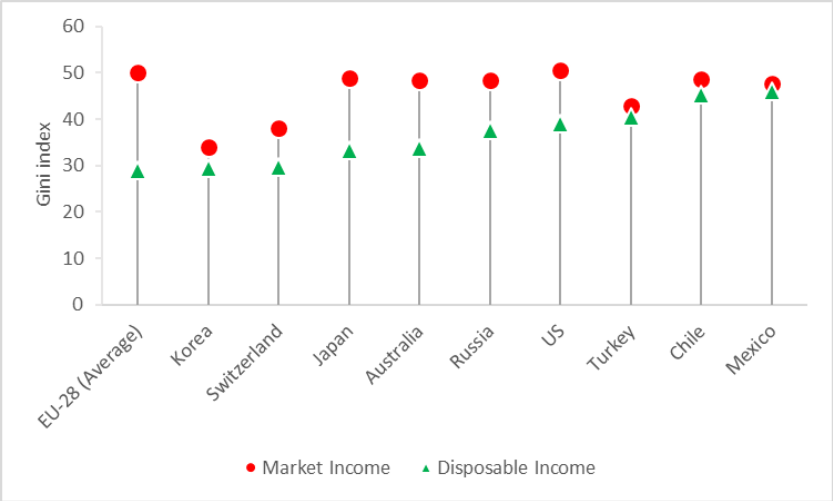
1. Introduction

If one has to single out a characteristic of European societies is their exceptional degree of income redistribution. In an often-cited paper Alesina, Glaeser and Sacerdote (2001) ask directly the question of "Why Doesn't the United States Have a European-Style Welfare State?" and emphasize that Europe redistributes to a much larger scale than the US, by using a more progressive taxation and more generous transfers, as well as more intrusive regulations to protect the poor. The evolution of the 'European-style' welfare system, whether it is still affordable, and its crisis are all subjects of a large literature, but there is a consensus that this system[1] has managed to strongly reduce inequality in incomes.

The redistribution taking place in Europe is the largest compared to other major OECD economies. Using data from the OECD, Income Distribution and Poverty Database[2], Figure 1 clearly highlights this. The average redistribution in the EU, measured as the difference between Market Income and Disposable Income inequality, averages 21 Gini points and, in fact, is almost twice as large as the redistribution occurring in the US where it corresponds to 11 Gini points. Further, the average redistribution of taxes and transfers in the EU is larger compared to the one observed in other high-income countries, such as Japan (16 Gini points), Australia (15 Gini points). Switzerland (9 Gini points) and Korea (5 Gini points). Finally, the redistributive effect of European taxes and transfers is on average much larger compared to the effect of taxes and transfers in developing economies where comparable indicators are available, such as Russia (11 Gini points), Chile (3.2 Gini points). Turkey (2.5 Gini points), and Mexico (1.9 Gini points).

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.

[1] It is also possible to speak of "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.

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

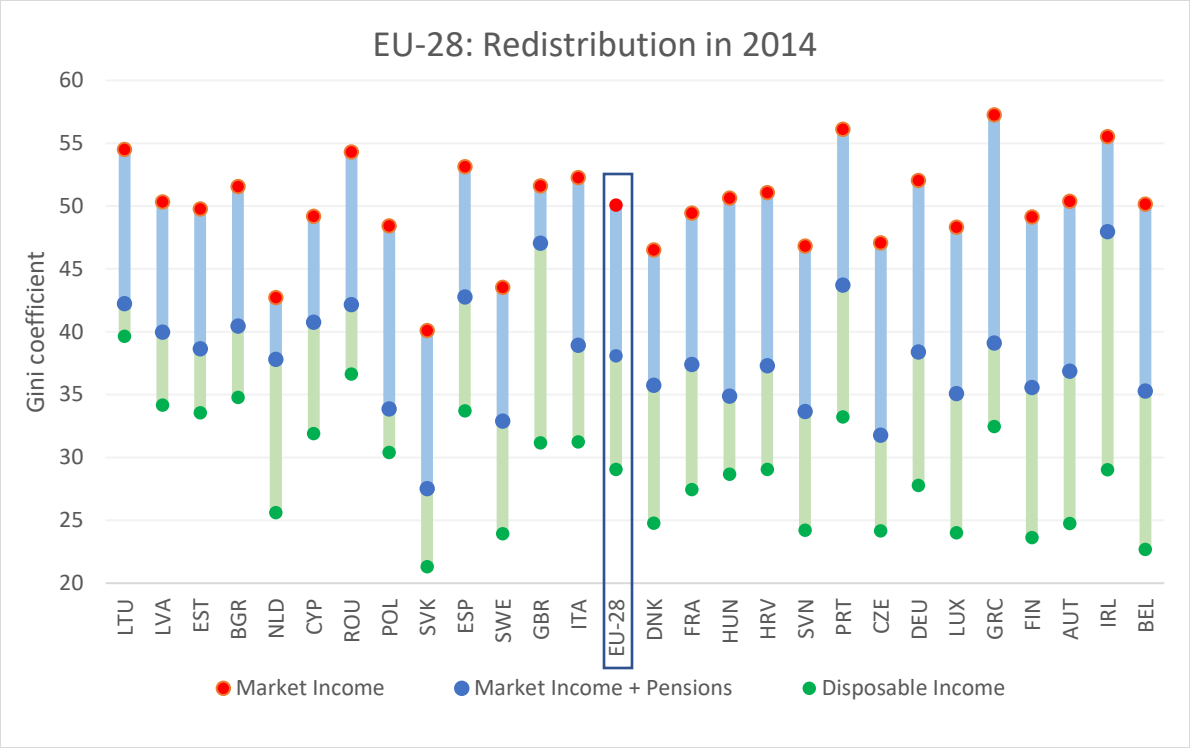
The redistribution shown in figure 1 has been defined as the difference between the Gini coefficient calculated on market incomes and the Gini coefficient based on disposable incomes:

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

This difference is a measure of the redistributive effectiveness of taxes and transfers at a given point in time: the larger this 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 or irregular type of jobs), capital income (e.g. interests, dividends, profits etc.), investment income, incomes from property, private pensions. Disposable income equals market income after direct taxes and social insurance contributions (for both employees and self-employed) are subtracted, and after transfers are added (including pensions, means tested benefits and non-means tested benefits). Direct taxes include for example personal income taxes, taxes on capital dividends and interests, property taxes. Indirect taxes (e.g. consumption taxes and VAT) are excluded from the analysis. The Gini coefficients for market income, market income plus pensions, and disposable income for EU-28 countries have been calculated using the microsimulation model EUROMOD (see Annex 1 for a description of the model), and are reported in Figure 2 below.

While on average, tax and transfer systems in EU countries substantially reduce market income inequality, redistribution varies across its countries**.** In general, tax-benefits systems contribute to reduce substantially market income inequality, primarily through pensions and secondly through transfers and direct taxes (Figure 2). On average, across EU-28 countries, public pensions contribute to reduce 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 generated by market incomes amounts on average to 21 Gini points in the EU. 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 the level of market income inequality. For example, Romania and Ireland have a similar, fairly high Gini index of market income, but the first country is able to reduce it by only 18 points, while the latter reduces it by 27 points. Conversely, the size of redistribution in Bulgaria and 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+.

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

This uneasiness in the European society brings up two dimensions along which welfare systems may be analyzed: first of all, it becomes relevant to assess the *change* in the redistribution. The stability of disposable income inequality can be the result of a bigger redistributive effort if market income inequality has increased, or it could have been the result of a smaller redistributive effort in the opposite scenario. Secondly, 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 variable such as age, occupation or household composition- may be increasingly what citizens care about as perceptions of inequality are more driven by their immediate context -their reference group- rather the economy as a whole (Bussolo, Ferrer-i-Carbonell, Giolbas and Torre, 2018). This paper will address both issues: it will assess the change in redistribution, both vertical and horizontal.

2. Assessing vertical redistribution

2.1 A general overview

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, it consists of asking whether the bars representing these differences becomes longer or shorter. In more formal terms, the change is defined as:

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

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

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

The larger this 'double-difference' $\Delta Redistribution_{t_1,t_0}$, the larger the redistribution over time, in each country. Note that one can re-write, as in the third line of the formal expression above, a change in the redistribution as the difference between what happens with the market income distribution and what happens with the disposable income distribution. For example, consider the case in which the double-difference is exactly equal to zero. This means that the increase in inequality generated by market forces is exactly equal to the increase in the inequality in disposable incomes, i.e. there has not been any additional redistribution.[3] However, if the expression is larger than zero, it means that the increase in market generated inequality has been, at least in part, reduced.

Using the proposed "double-difference", Figure 3 plots $\Delta Redistribution_{2014,2007}$ for Western and Eastern EU countries. The values on the vertical axis corresponds to Gini points. The chart shows that in Western Europe, the size of the redistribution has increased in most countries between 2007 and 2014. 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[4]. On the contrary, in Germany, Sweden and France, the redistributive effects of taxes and transfers has slightly declined.

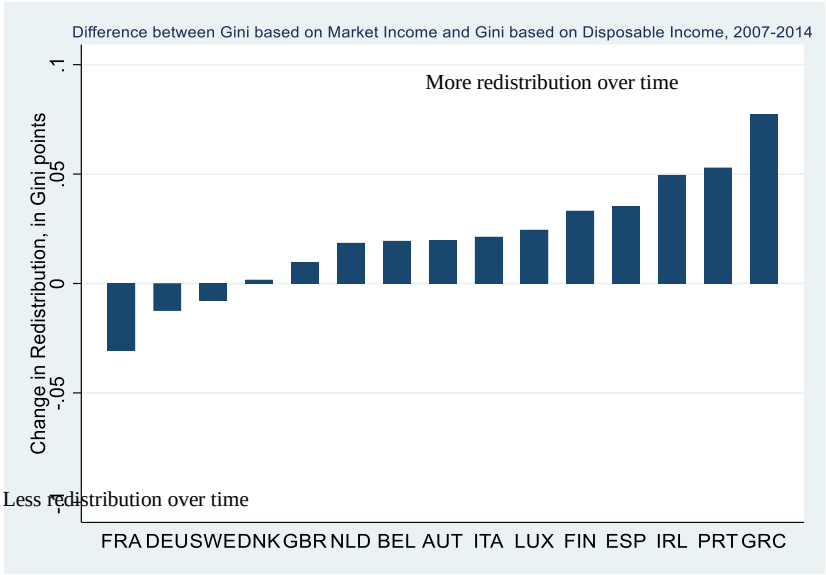
In Eastern Europe, the evidence is more mixed: in about half of the countries, redistribution has increased over time, while in the other half, it has shrunk. In Hungary, for instance, the reduction in redistribution been quite significant, equivalent to over 5 Gini points between 2007 and 2014. Reductions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

[3] 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 have to work harder. As Kanbur (2018) highlights, in this case of higher levels of inequality, the volume of redistribution is higher.

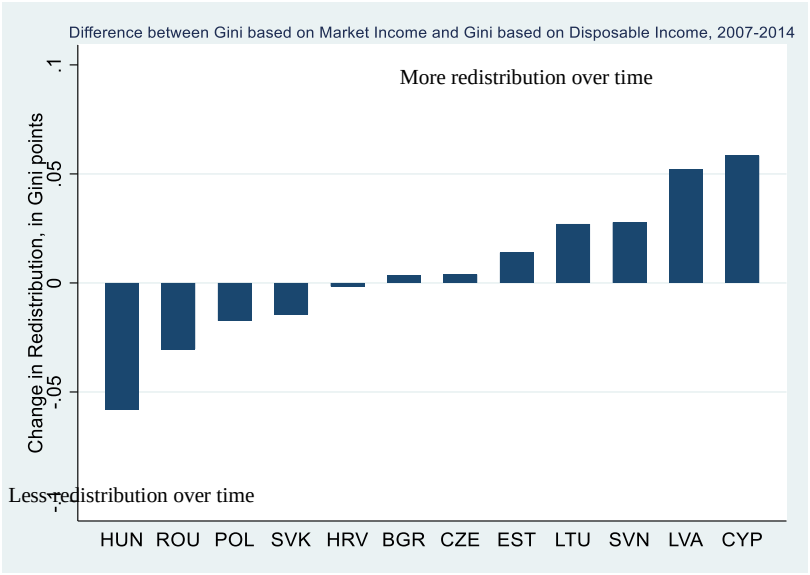
[4] As we show later, most of this change was not due to changes in taxes and transfer policies but, rather, to an almost automatic effect in a context of worsening market income inequality.

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

a. Western Europe



b. Eastern Europe



Source: Calculations based on EUROMOD H1.0+.

2.2 Decomposing changes in vertical redistribution

Changes in the redistribution over time can be the result of both changing of the structure of the economy, and active policy changes in the systems of taxes and transfers. 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-benefits policies, as opposed to changes due to shifts in the structure of the economy. An example may clarify this. Imagine a population that is aging and a pension system that provides pension benefits that are of equal amount to all old people. With the passing of time a larger proportion of people will become recipient of pension and, if the tax as well as the pension systems remain unchanged, inequality of disposable incomes will go down, and the redistribution will appear to be increasing. This redistribution is 'automatic' and depends on the change in the age structure of the population, not on an active change in the rules of taxation or of the benefits. Similar examples can be described for the protection provided by automatically inflation-adjusted minimum wages or transfers.

By using a decomposition method proposed by Bourguignon and Ferreira (2005), it is possible to express the change in the size of redistribution over time 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 instead 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 define first the Gini coefficient as function of the distribution of income. The Gini coefficient of market income is a function of the distribution of market income (1), and the Gini coefficient is a function of the distribution of disposable income (2).

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

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

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 in (3).

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

We define now the redistribution at a given point in time, as the difference between the Gini coefficient of the market income distribution and the Gini coefficient of the disposable income distribution.

$$Redistribution_t = Gini_t^{market} - Gini_t^{disposable} \quad (4)$$

The change over time is simply the difference between redistribution in one period and redistribution in another period

$$\Delta Redistribution_{t_1-t_0} = \left[Gini_{t_1}^{market} - Gini_{t_1}^{disposable}\right] - \left[Gini_{t_0}^{market} - Gini_{t_0}^{disposable}\right] \quad (5)$$

The change in redistribution over time can be rewritten as the change in the Gini coefficient of market income over time and the change in the Gini coefficient of disposable income over time (6).

$$\Delta Redistribution_{t_1-t_0} = \left[Gini_{t_1}^{market} - Gini_{t_0}^{market}\right] - \left[Gini_{t_1}^{disposable} - Gini_{t_0}^{disposable}\right] \quad (6)$$

We can then replace (1) and (3) into (6) to further decompose the change in the Gini coefficient of disposable income over time.

$$\Delta Redistribution_{t_1-t_0} = \left[G(f(y_{t_1}^{market})) - G(f(y_{t_0}^{market}))\right] - \left[G\left(f\left(y_{t_1}^{market}, TB_{t_1}\right)\right) - G\left(f\left(y_{t_0}^{market}, TB_{t_0}\right)\right)\right] \quad (7)$$

The change in the Gini coefficient of disposable income over time (second term in brackets in (7)) will then depend on the change due to changes in the market income and on the change due to changes in the tax and transfer system. In this sense, we can further decompose the change in the Gini coefficient of disposable income over time in two components by making use of counterfactual simulations (Bourguignon and Ferreira, 2005).

$$\begin{aligned}\Delta Redistribution_{t_1-t_0} = &\left[G\left(f\left(y_{t_1}^{market}\right)\right) - G\left(f\left(y_{t_0}^{market}\right)\right)\right] \\ &- \left[G\left(f\left(y_{t_1}^{market}, TB_{t_0}\right)\right) - G\left(f\left(y_{t_0}^{market}, TB_{t_0}\right)\right)\right] \\ &- \left[G\left(f\left(y_{t_1}^{market}, TB_{t_1}\right)\right) - G\left(f\left(y_{t_1}^{market}, TB_{t_0}\right)\right)\right] \quad (8)\end{aligned}$$

The first term 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 the market income – that is, the change in the Gini coefficient of disposable income that would have been observed if the system had remained unchanged and only the market income would have changed between the two periods. 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 would have 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 the sets of counterfactuals will be different since this decomposition method is path dependent. In order to control for this, a common practice in the literature is to take the average of both decompositions for each component.

From equation (8) one can see that a change in the distribution of market income from t_0 to t_1 affects the size of redistribution in two ways: on the one hand, it affects the Gini coefficient of market income (the first term in brackets in (8)), and on the other hand, it affects the Gini

Change in redistribution

coefficient of disposable income absent any changes in the tax and transfer system (the second term in brackets in (8)). In this sense, the total effect of a change in the distribution of market income is the sum of the first two terms in brackets in (8). The remaining term accounts for the changes in redistribution due to changes in the tax and transfer system. Summing up, then:

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

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

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

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

Market component

Policies component

Details on how to obtain counterfactual distributions using the static microsimulation model EUROMOD, are also described in Annex X.

A final remark is important here. The policy component measures the share of redistribution that is due to active policy changes but these changes do 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. It may be possible that this generates a redistribution, but this was not the primary objective of the policy change.

2.3 Decomposition results: general trends

Policy changes were the main drivers of the increase in redistribution in the EU15 countries from 2007 to 2014, with the surprising exceptions of a few traditionally generous welfare systems, such as Denmark, Sweden and Belgium (figure 4). The largest increase in redistribution purely due to changes in tax-benefits 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 the remaining countries, the contribution of active changes in taxes and transfers to the redistribution varies between 1 and 2 Gini points. In some countries (e.g. the United Kingdom), changes in tax/transfer policies compensated for the negative effect of other changes (that is, due to the interaction of changes in market income and the design of the system, labeled market income component) on income distribution, while in other countries (e.g. France) policies only partially compensated for the deterioration of income redistribution driven by other forces. In many countries, the extent of redistribution due to policy changes differs significantly from the overall change in redistribution (e.g. Greece has the largest rise in redistribution from 2007 to 2014, but only the 5th largest increase in redistribution due to policy changes). Annex B describes policy changes that had a significant impact on redistribution, covering selected countries.

In contrast to the EU15, changes in taxes and transfers policies in the EU13 countries reduced the amount of redistribution in half of the countries (figure 5). The total amount of redistribution, and the redistribution resulting from active policy changes, increased in only a handful of countries. Again, the change in the total amount of redistribution often differed substantially from the change in redistribution due to policy changes. Indeed, in several countries the change in total distribution was much larger than the change in redistribution due to policy changes; often governments did not compensate for the decline in redistribution driven by the structure of the system. For example, Romania had the third-highest increase in redistribution due to changes in taxes and transfers, but that was not sufficient to compensate for the decline in redistribution driven by changes in the underlying structure of the system (labeled market income component in Figure 5). In a few countries, including Lithuania and Hungary, and, to a minor extent, Poland, Bulgaria and Czech Republic, changes in tax/transfer policies actually reduced the amount of redistribution.

Figure 4.a. Decomposition of changes in redistribution in Western Europe (sorted by Change in Redistribution)

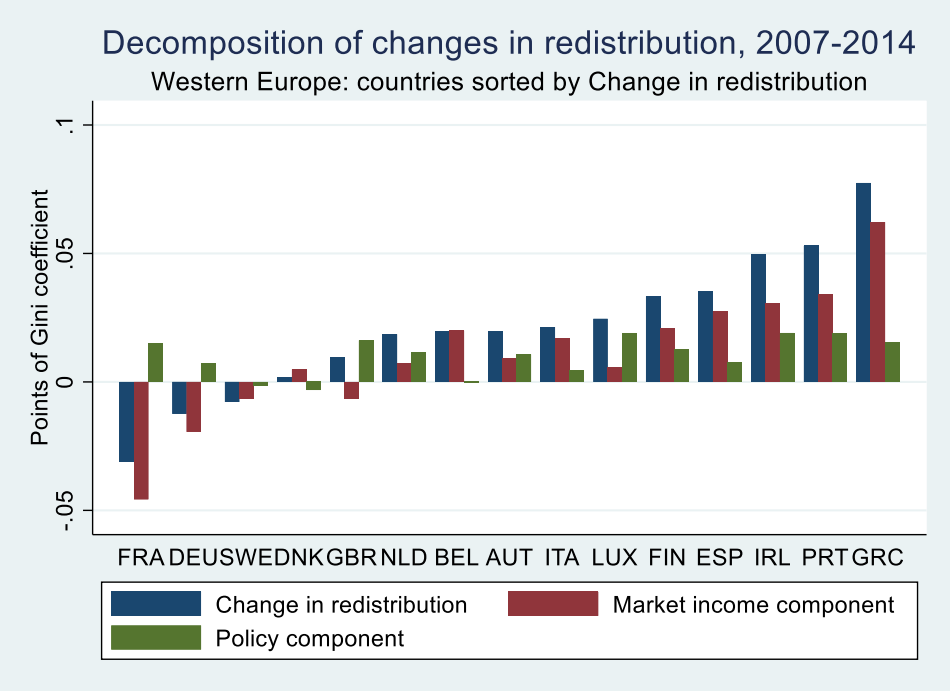


Figure 4.b. Decomposition of changes in redistribution in Western Europe (sorted by policy component)

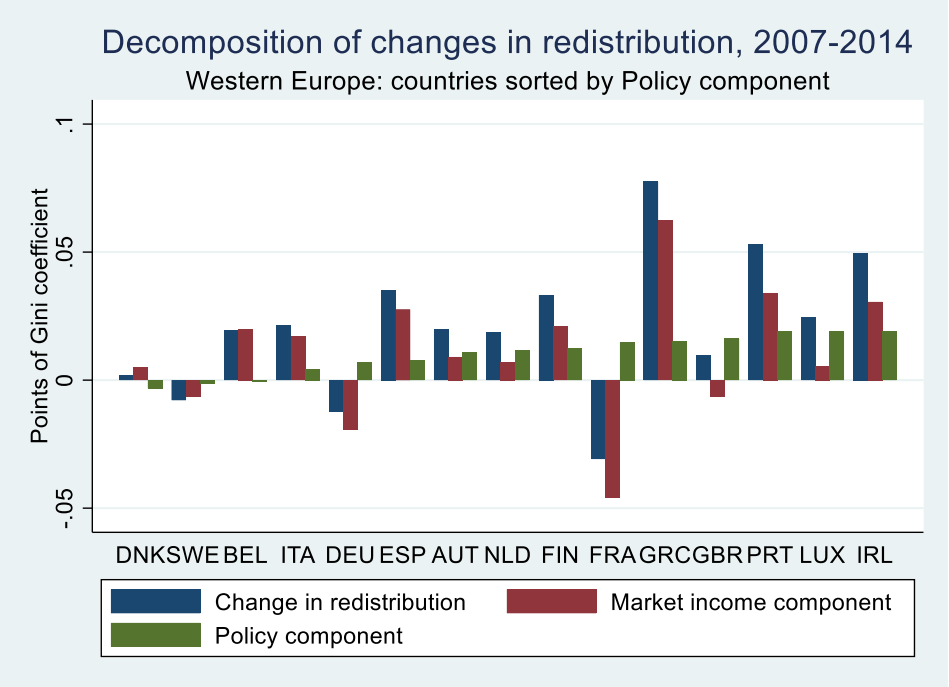


Figure 5.a. Decomposition of changes in redistribution in EU 13

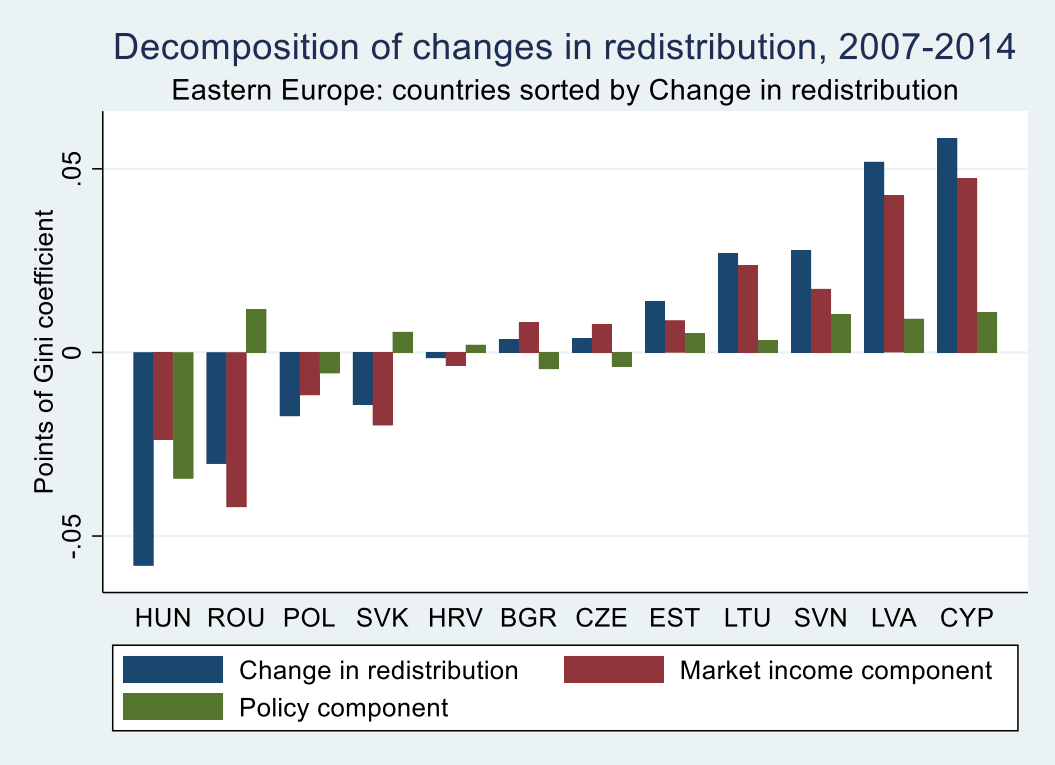
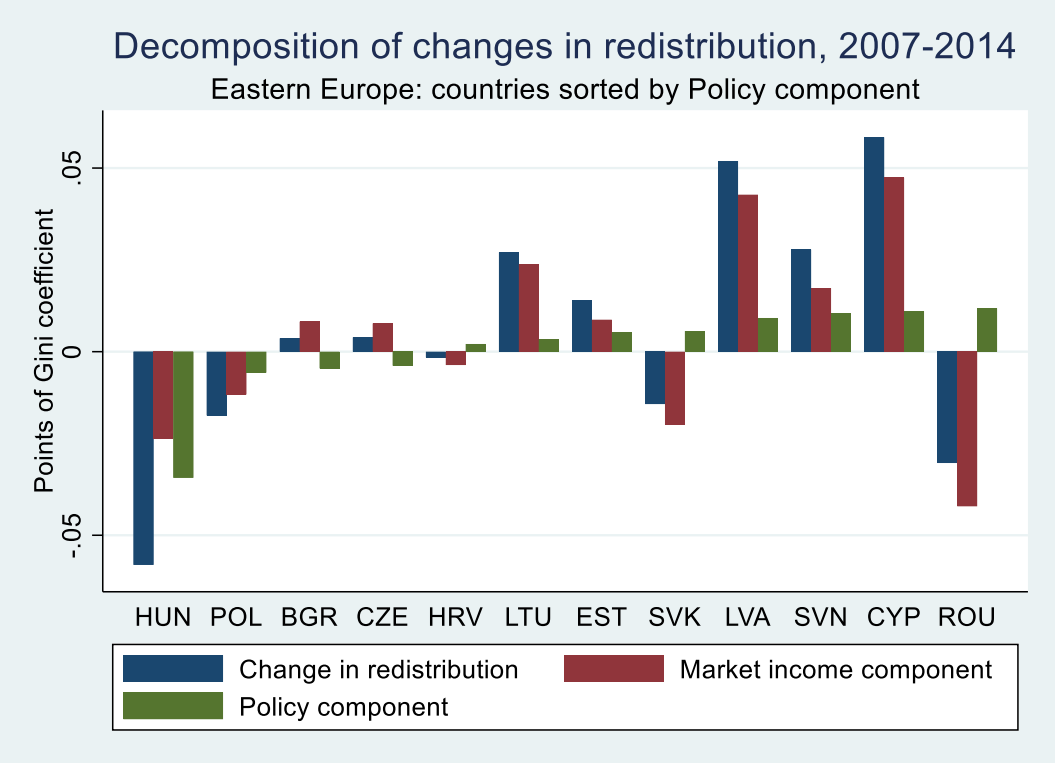


Figure 5.b. Decomposition of changes in redistribution in EU 13 (sorted by policy component)



2.3 Decomposition results: tax and transfers

Disentangling the counterfactual analysis by taxes and transfers, shows that changes in the tax systems have affected vertical inequality more than changes in transfers**.** In this section we analyze the incidence of direct taxes (including social insurance contributions) and transfers (pensions, means tested benefits and non-means tested benefits) across the deciles of the income distribution. In each country, for each decile of gross income (defined as market income plus total transfers), we plot the share of taxes (and, separately, of transfers) on the decile's gross income. We consider the incidence of taxes and transfers for the 2007 and 2014 tax-benefits systems, and for one counterfactual scenario, obtained by running the 2007 tax-benefits rules on 2014 incomes.

More formally, we define our indicator of incidence of taxes and benefits as:

$$Incidence^{x}_{d,c,y} = \frac{x_{d,c,y}}{Gross\ Income_{d,c,y}}$$

- where *x* is equal in turn to: total transfers; pensions; means tested and non-means tested benefits; total direct taxes and social insurance contributions; direct taxes only.
- where: *d* = deciles of gross income; *c* = country; *y* = year;
- and where: *Gross Income = Market Income + Total transfers*.

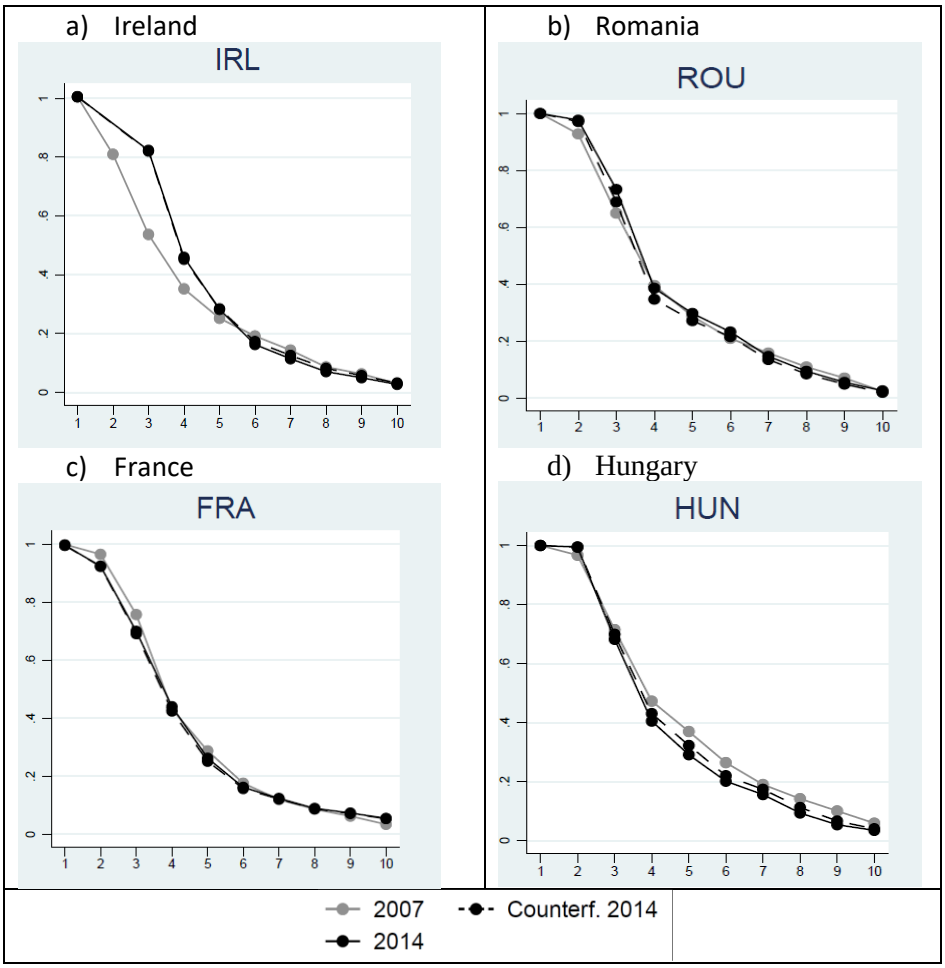
The counterfactual scenario captures therefore the changes in the incidence of taxes and transfers, that would have prevailed in 2014, if the tax-benefits rules had remained as in 2007. Figures 6 and 7 shows the incidence of taxes and transfers for these three scenarios for a selection of countries, focusing on those countries showing either a large increase or a large decline in redistribution over time, as discussed in the previous paragraphs. The results for the full set of countries in EU-28, and for all possible definitions of *x* are shown in the Appendix.

The top panels of Figure 6 show the incidence of total transfers for the countries with the largest increase in redistribution due to the policy component, in both Western and Eastern Europe: Ireland and Romania. The charts show that in Ireland (panel a), the incidence of transfers on gross incomes has increased over time, especially for the poorest 4 deciles. However, the counterfactual distribution overlaps with the distribution observed in 2014, which implies that benefits incidence in 2014 is very similar to the one that would have been observed if the 2007 system had been still in place. In Romania we observe a similar pattern: the incidence of benefits is slightly higher for the bottom deciles in 2014, but there is no substantial difference with respect to the counterfactual scenario – which means that there has been no role of active changes in transfer policies.

The bottom panels of Figure6 instead, show the incidence of transfers across the gross income deciles in France and Hungary. In France the incidence of benefits has actually slightly declined over time at the bottom. Further, there is no substantial difference between the counterfactual and the observed scenario in 2014. In Hungary, the country exhibiting the largest decline in redistribution induced by changes in tax-benefits policies, the incidence of benefits declined for

the middle-class and the top deciles, and declined even more compared to the counterfactual scenario, had the tax-benefit system remained unchanged as in 2007.

Figure 6. Incidence of transfers (means tested, non-means tested benefits and pensions) on each decile's gross income



Source: calculations based on EUROMOD H1.0+. Dark line: 2014, grey line: 2007. Dash-dark: counterfactual simulation (2007 system and 2014 incomes).

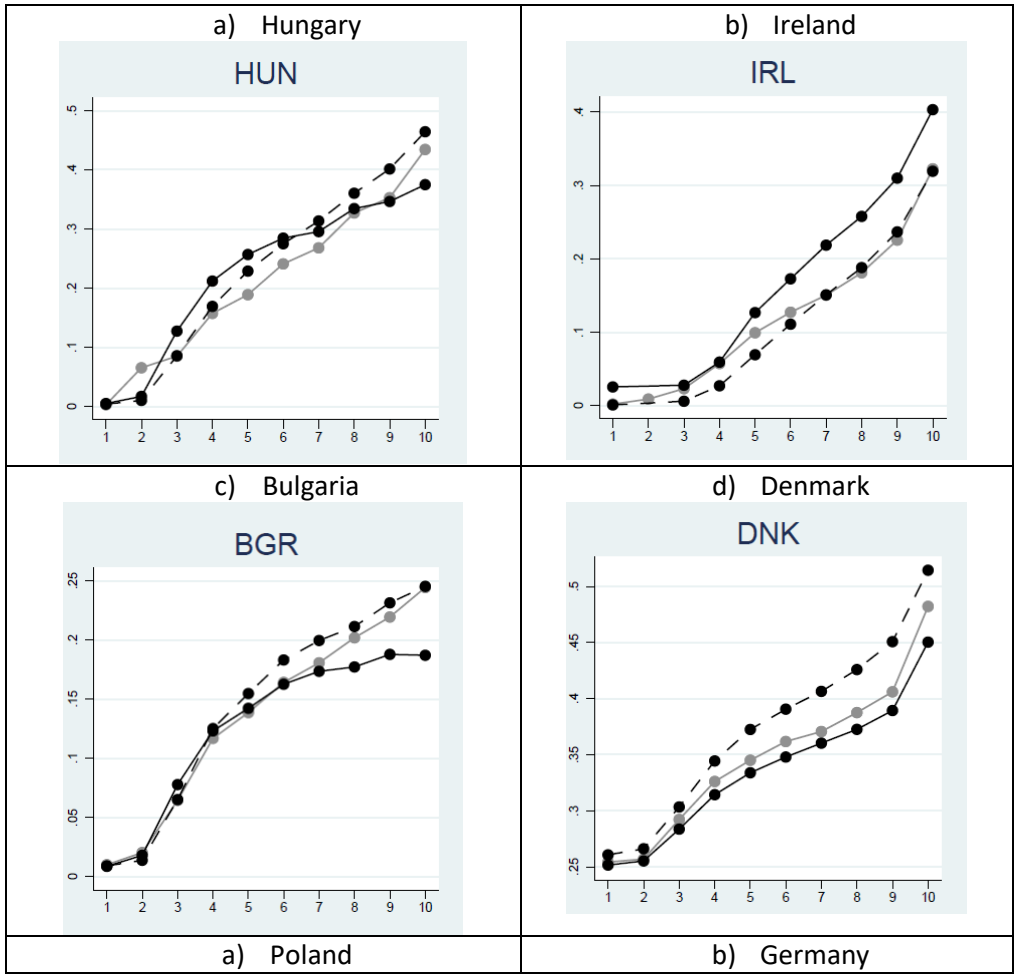
Looking instead at the incidence of taxes and social insurance contributions across deciles (Figure 7), shows several interesting findings. First, of all, Ireland is one of the few countries where the incidence of taxes and social insurance contributions seems to have become more progressive over time, showing a larger increase for the richest than for the poorest deciles. Further, the incidence of taxes in 2014 is much higher than in the counterfactual scenario, so active policy changes seem to have led to greater progressivity. These trends might explain why Ireland is the top performer among EU countries in terms of redistribution explained by policy change.

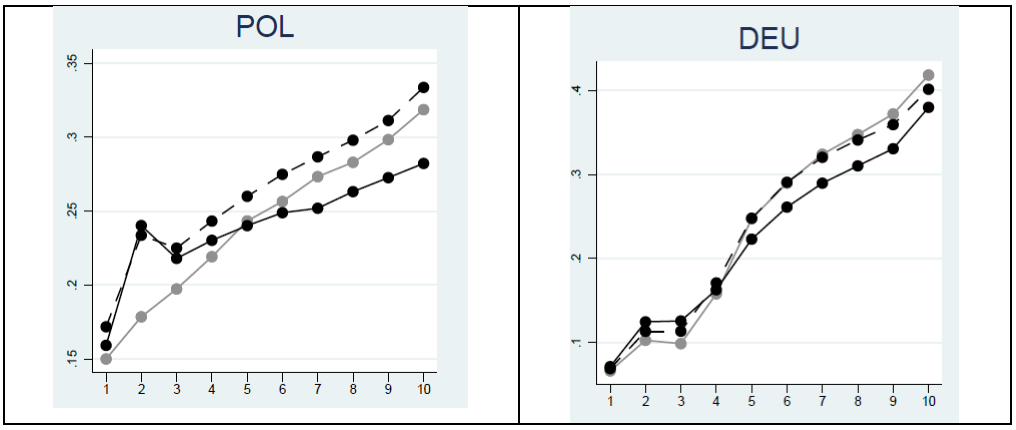
On the other hand, in several countries that have shown a decline in the size of redistribution associated to the policy component, we notice a consistent pattern of reduced tax progressivity over time. This is the case of Hungary, Bulgaria, Poland, and Denmark, where the incidence of

taxes has declined for the richest deciles much more than for the poorest ones: further, tax incidence has declined much more than if the tax-benefits rules had remained constant as in 2007. In Germany, we observe a similar pattern as in the countries mentioned above, and most likely, with greater tax incidence for the richest deciles, the country would have achieved a larger redistribution.

In summary, these examples show that active changes in tax policies seem to have mattered more than changes in transfers, and, in several countries, have led to lower rather than greater redistribution.

Figure 7. Incidence of taxes and social insurance contributions on decile's gross income





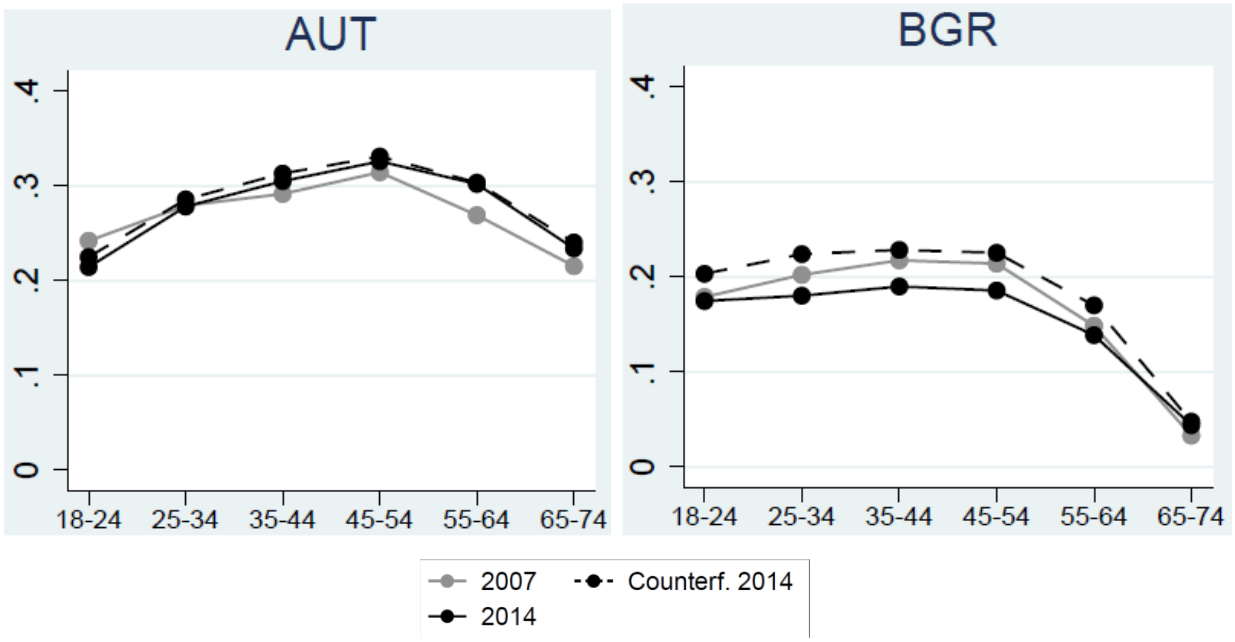
3. Assessing horizontal redistribution

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

3.1 Across age groups

One of the horizontal dimensions which we have discussed in chapter 2 of this report is the generational dimension. As growth has slowed down and labor market reforms have increased the prevalence of precarious employment, income levels of the younger generations have taken a hit. At the same time, the income levels of older generation have been roughly stable. How do the tax and transfer system perform across age groups and how did they evolve in the last years? To answer the first part of this question one can look at Figure 8, which shows, the average tax rate paid on income by age groups in two different countries in Europe – Austria and Bulgaria.

Figure 8 – Different age-tax profiles across Europe
Average tax and social contributions rate by age group, 2014



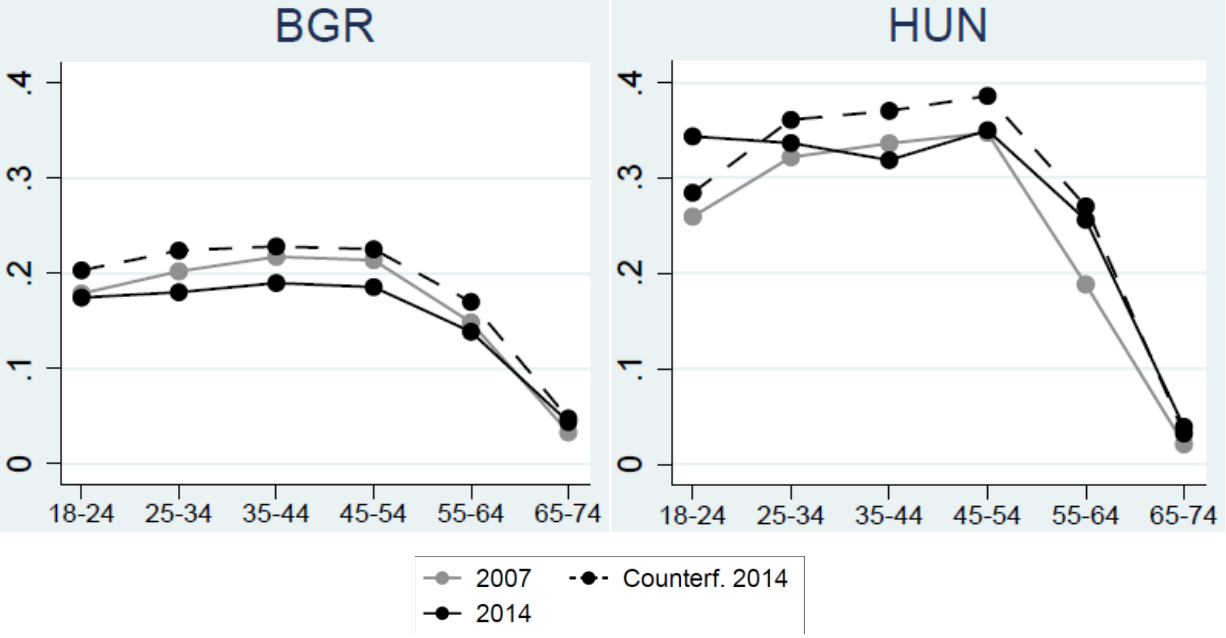
Source: Calculations based on EUROMOD H1.0+.
Note: the grey line indicates the average tax an social contributions rate, calculated as a share of gross income, for 2007. The black solid indicates the same variable for 2014. The black dashed line indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

Two different age-tax profiles emerge in Figure 8. On the one hand, in Austria the average tax rate follows the typical life cycle of income. As individuals age, they acquire experience and their income levels increase, reaching their peak at the late middle age. Similarly, the average tax rate grows from around 22% for those aged 18-24 to around 32% for those aged 45 to 54. After retirement, when incomes typically decrease, the average tax rate also follows – with the average tax rate of those older 65 being around 24%. This parallel behavior of incomes and average tax rate is characteristic of 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. The average tax rate is quite flat and increases very slightly along the life cycle for all groups in working age – between 18 and 55 years. Only for the older age groups, when retirement starts, does the average tax rate go down. In this sense, the lowest income age groups -the very young and the very old- are treated differently. Whilst those between 18 and 24 years of age pay an average tax rate close to 17%, those older than 65 pay a tax rate of 5%. Whilst not a regressive system -the average tax rate doesn't decrease as income levels increase-, this system does treat low income people differently depending on their age. Young individuals pay an average tax rate similar to those of richest age group and pay almost three 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 inequality. The smaller vertical redistribution observed in Bulgaria with respect to Austria is reflected, horizontally, in the uneven treatment of the poorest age groups: whilst 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 – the youngest, poor age group pays a tax rate very similar to that of the richest, middle-aged

group. This non-progressive taxation across age group can be a source of distributional tension in itself. In Annex X the age-tax profiles of 28 European countries are shown, and a clear divide emerges: the progressive profile of Austria is found in most of the Northern, Southern and Western European countries. The non-progressive tax profile of Bulgaria 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 ex-ante a progressive tax system. Thus, in order to better understand the nature of the difference in age-tax profiles across Europe it is useful to decompose the changes observed over time.

Figure 9 – Regressive changes in tax system across age groups
Average tax and social contributions rate by age group, 2007-2014



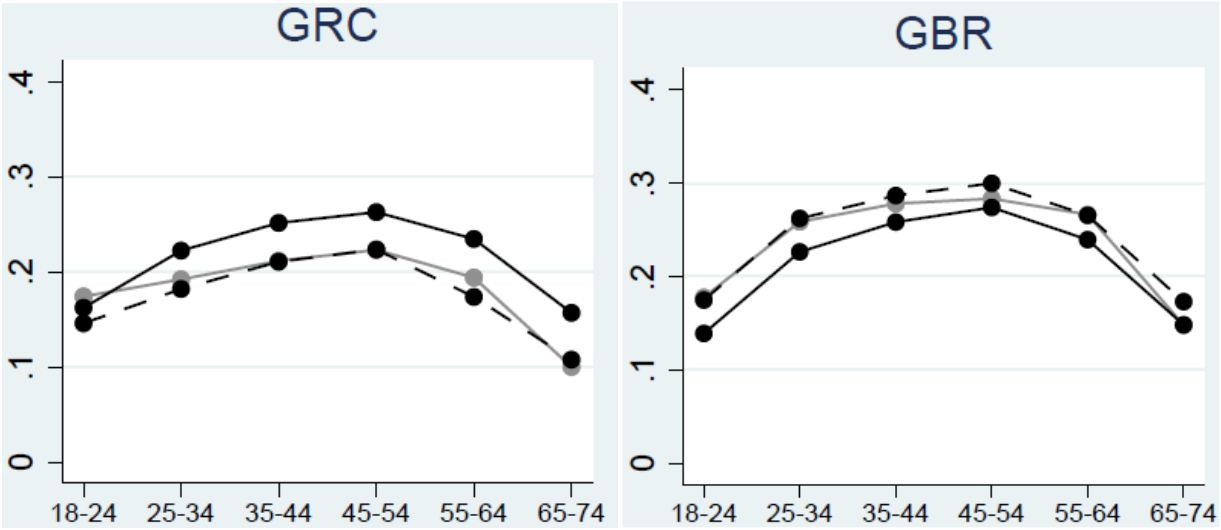
Source: Calculations based on EUROMOD H1.0+.
Note: the grey line indicates the average tax an social contributions rate, calculated as a share of gross income, for 2007. The black solid indicates the same variable for 2014. The black dashed line indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

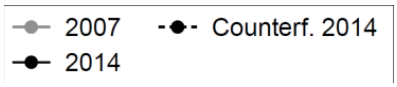
In Figure 9 two examples of changes in the average tax rate in Central and Eastern Europe are presented. In the case of Bulgaria, the relatively "flat" age-tax profile for the working age groups in 2014 was not present in 2007, when the average tax rate did increase between age 18 and 45. The "flattening" of the tax profile is mostly accounted the change in the tax system: had the system not changed, tax rates would have increased for all age groups -as the counterfactual simulation for 2014 shows-, but the reduction was stronger for middle aged groups than for the youngest, whose tax rate remained in 2014 basically the same as in 2007, whilst for those aged

35 to 55 it dropped close to 5 percentage points. In the case of Hungary, the "flat" age/tax profile emerged after the implementation of the flat tax on personal income. This resulted from an increase in the average tax rate to the very young -those aged between 18 and 24- and a reduction in the tax rate for those aged between 45 and 55. The cases of Bulgaria and Hungary are not the only ones in Europe: Latvia, Lithuania and Poland are other countries were active changes in the tax system resulted in a more regressive profile. In this sense, whilst from a static point of view Central and Eastern European countries have systems which are relatively pro-old because of difference in relative incomes, the changes in the system have made it more so. In this sense, whilst the market has been relatively benevolent with the younger generations of Central and Eastern Europe, the governments have been less so.

In figure 10 two examples of progressive tax changes across age groups are presented – Greece and the United Kingdom. In the case of Greece, average tax rates increased between 2007 and 2014 for all age groups – but particularly for the middle aged. The very young almost saw no increase in their average tax rate, whilst the very old saw an increase that put them at the same level as the very young. In this sense, the counterfactual simulation identifies the active changes in the tax system as the main component of the effective increase in tax rates. In fact, had it not been for changes in the system, the average tax rate would have decreased or remained stable in 2014. In the case of the United Kingdom, the average tax rate decreased for all age groups, except for those older than 65, which saw no change in the rate. The decrease in the tax rate was, however, stronger for the youngest groups. In this sense, the system became more progressive. Countries that observed a similar pattern as Greece -increase in average tax rates in a progressive fashion- where Cyprus, Portugal and Spain, whilst countries observing a similar pattern as the United Kingdom are Germany and Sweden. To the point that in Southern and Western Europe the income levels of the younger generations faired particularly badly with respect to the middle aged and the old, these changes in the tax system have partly compensated the negative outcomes coming from the market.

Figure 10 – Progressive changes in tax system across age groups
Average tax and social contributions rate by age group, 2007-2014

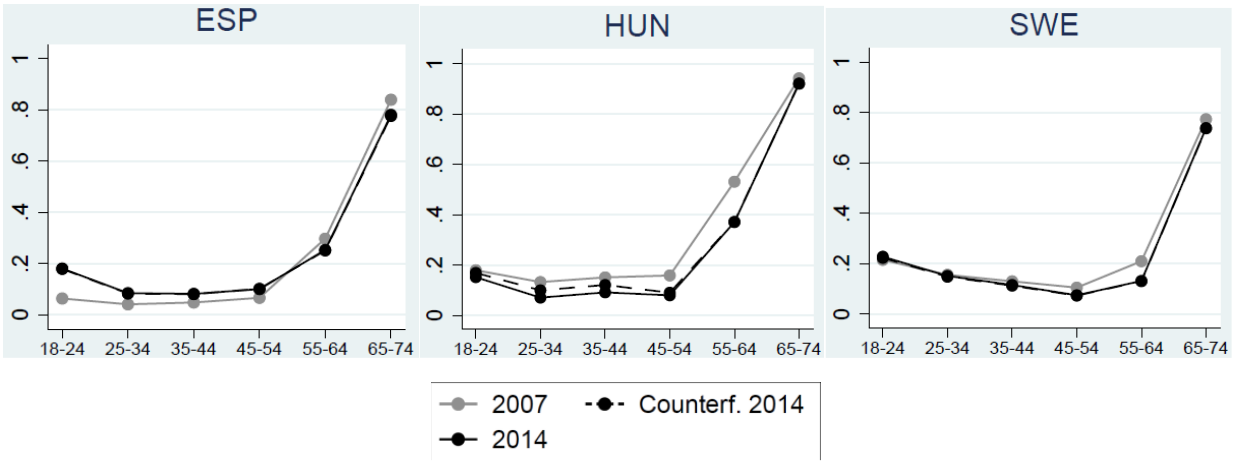




Source: Calculations based on EUROMOD H1.0+.
Note: the grey line indicates the average tax an social contributions rate, calculated as a share of gross income, for 2007. The black solid indicates the same variable for 2014. The black dashed line indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

So far the analysis has focused only on taxes and social contributions. In the previous subsection, it was shown that the transfer system didn't experiment considerable changes from a vertical point of view – the concentration and incidence of transfers per decile of income remained relatively unchanged over time. In figure 11 three examples of the age profile of incidence of transfers (express as share of gross income) are presented – Hungary, Spain and Sweden. The patterns are expected: the highest incidence is for the oldest age group, whose income is basically composed entirely of transfers – namely pensions. Some changes over time can be seen – 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 -by 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. In this sense, the observed changes in the incidence of transfers across age groups between 2007 and 2014 are not due to changes in the parameters of the transfer system but to the normal behavior of the system in a context of changes in the market income. Only in Hungary do changes in the transfer system have some relevance, and explain a small part of the decrease in transfer incidence observed for those in the working age.

Figure 11 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 grey line indicates the average tax an social contributions rate, calculated as a share of gross income, for 2007. The black solid indicates the same variable for 2014. The black dashed line indicates the counterfactual rate in 2014 had the tax and transfer system been the same as that of 2007.

The same pattern as in these three countries – changes in the incidence of transfers explained almost entirely by market forces – is present throughout Europe. In a context of limited growth of income for the younger generations in Southern and Western Europe, this has resulted in an

increase in the incidence of transfers for the youngest age groups. In Central and Eastern Europe, the incidence of transfers among the youngest has remained mostly stable in shares below 20%.

The overall picture that emerges from the analysis across age groups in Europe is a dual one. The reaction of the tax and transfer systems can be decomposed in two – an automatic, market driven change in tax and transfer incidence and an active change in the system's parameters. 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, even if transfers don't increase in absolute values, their incidence will increase. Little action has been seen in regions where younger generations' income have done fairly better – like Northern or Central and Eastern Europe. No active change in the parameters of the transfer system appears to have had a significant contribution to changes in 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 to the very young and the very old. 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 an horizontal, generational point of view.

In sum, the reaction of the tax and transfer system in Southern and Western Europe appears to have been, both by automatic action and by active decision, in favor of the younger generations that have seen a relative decrease in their income – that is, alleviating a potential source of distributional tension. In contrast, in Central and Eastern Europe the relatively better prospects coming from market forces for those same generations have been compensated, negatively, by active changes in the tax system, potentially creating a source of distributional tension.

3.2 Across occupations

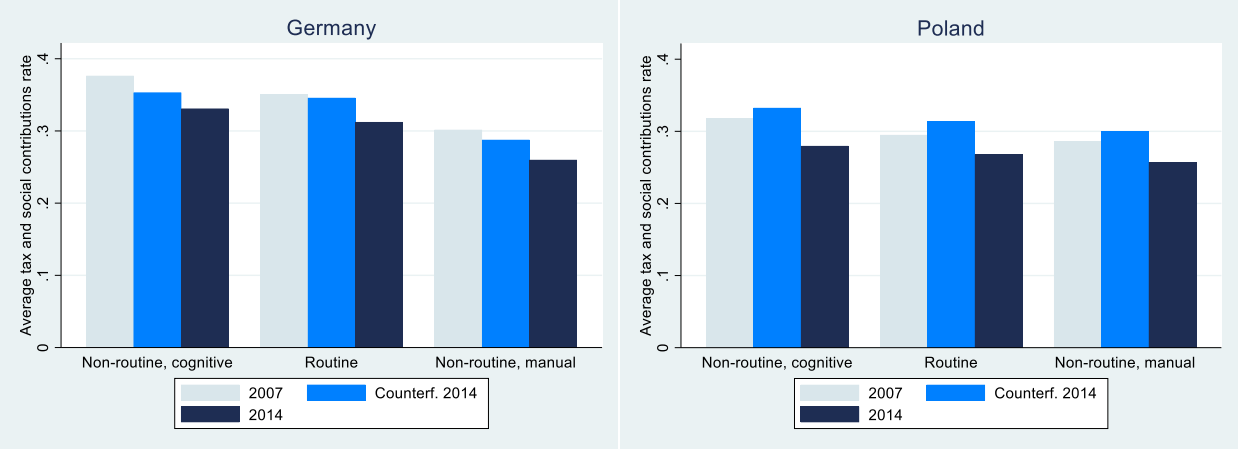
Another horizontal dimension which is relevant for this report is the occupational one. To the point that de-routinization and job polarization are phenomena present across Europe -and particularly in Southern and Western Europe-, it is of interest to analyze how the tax and transfer system has reacted to them. 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-. On the other hand, the relative wages paid to those in non-routine, cognitive task intensive occupations have increased.

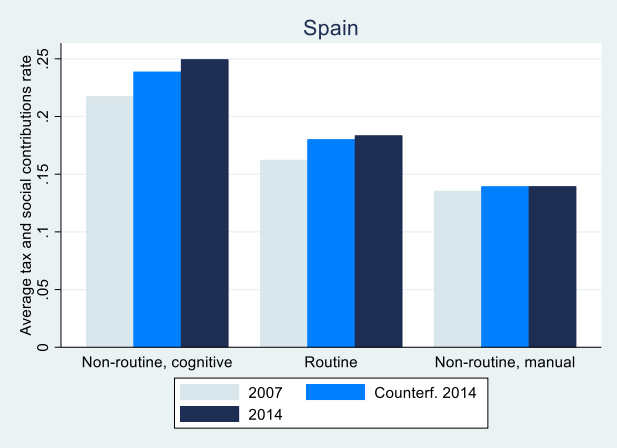
Figure 12 presents the average tax and social contributions rate paid by each of three occupational groups in three EU countries: Germany, Poland and Spain. In all these countries the main trends on occupational change were present – polarization of occupations and a regressive change in wages.

First of all, 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: whilst in Germany and Spain the difference between the highest and the lowest average tax rate was, in 2014, around 10 percentage points, in Poland that same difference was closer to 4 percentage points – in line with the relatively "flat" tax profile of that country.

The evolution of the average tax rate over time reveals different patterns. In Germany, the average tax rate has slightly fallen for the three occupation groups, but more for the highest paid occupational group – non-routine, cognitive task intensive occupations. This regressive change is, however, a combination of market forces going in one direction -making tax rates converge- and active changes in the tax system going in the opposite direction -making tax rates diverge-. In fact, the simulated counterfactual scenario indicates that, had the system not changed, the average tax rate would have decreased the most for non-routine, cognitive task intensive occupations and left those of routine task intensive and non-routine, manual task intensive occupations relatively unchanged. Active changes in the tax system lead to a 3 percentage point reduction in average tax rate for these two occupational groups, and a decrease in 1 percentage point for the non-routine, cognitive task intensive occupations. In this sense, the occupational groups negatively affected by job polarization appear to have been actively compensated by the tax system.

Figure 12 – Different reactions of the tax system to job polarization
Average tax and social contributions rate by occupational group, 2007-2014





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.

A contrasting situation is found in Poland. The average tax rate has also decreased in this country for the three occupational groups and, as in Germany, the biggest decrease was seen for those in non-routine, cognitive task intensive occupations. This resulted in a tax rate convergence. But, differently to Germany, the counterfactual simulation shows that active policy changes fostered this convergence rather than compensate it: system changes resulted in a decrease of 4 percentage points in the tax rate of non-routine, cognitive task intensive occupations, a 3 percentage point decrease in the tax rate of routine task intensive occupations, and a decrease close to 1 percentage points in the tax rate of non-routine, manual task intensive occupations. In this sense, the winners of job polarization -non-routine, cognitive task intensive occupations- obtained the biggest decrease in average tax rates. Rather than alleviating distributional tensions emerging from occupational change, the tax system in Poland appears to have fostered them.

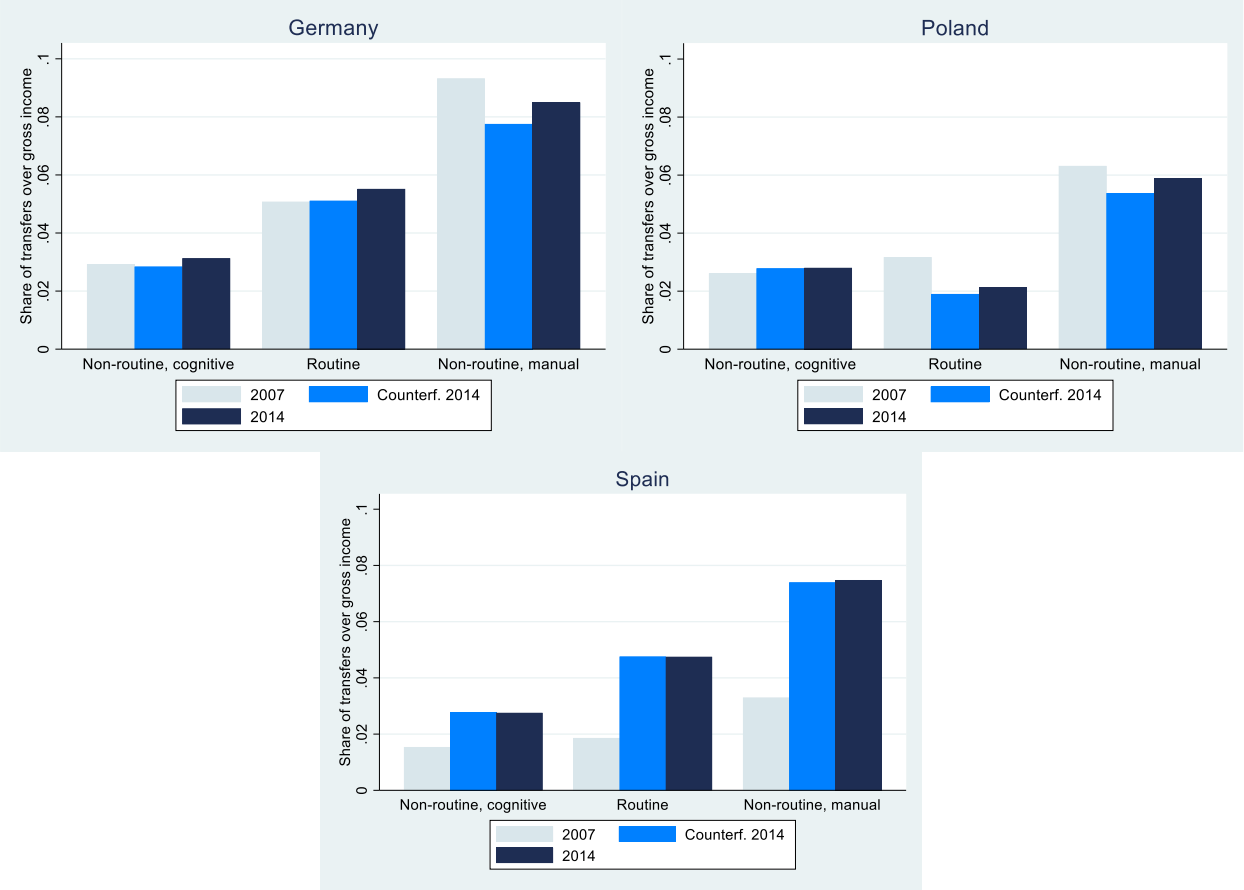
Lastly, the case of Spain reflects a mostly market driven, automatic reaction of the tax and transfer system. The average tax rate for non-routine, cognitive task intensive occupations increased by close to 2 percentage points between 2007 and 2014, that of non-routine, manual task intensive occupations decreased by a similar amount and the average tax rate faced by routine task intensive occupations remained virtually stable. Active changes in the tax system don't explain any of the change observed in the tax rate of the "losers" of job polarization, whilst they only explain half of the actual increase in tax rates of non-routine, cognitive task intensive occupations – the "winners" of occupational change. 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, but no active change in the tax system seems to have worked on top of this.

Across Europe these three different patterns -active positive compensation, active negative compensation and automatic compensation- are replicated in many countries (see Annex X). Among the ones similar to Germany one can point out Belgium, the Czech Republic, Finland

and Sweden. Those with a similar pattern to Poland are Bulgaria and Hungary. Lastly, those were most of the change is explained by automatic reaction of the system, like in Spain, are France, Romania and Slovenia. Differently to the case of the horizontal, generational dimension, where a stark East-West divide was present, the scenario is more mixed with respect to the behavior of the tax system.

The evolution of transfer systems over time, differently to the case of the analysis across age groups, shows that, though often small, some policy changes have had an impact in different occupational groups (Figure 13). Given that the focus of this analysis is 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 France, where transfers make up to 12% of gross income. Over time there have been, however, some slight differences. 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 explain practically nothing of the observed increase in the share of transfer over gross income for all occupational groups. The whole change can be explained by the automatic reaction of the system in a context of changing market income.

Figure 13 – Limited role of policy changes in the transfer system across occupations
Average tax and social contributions rate by occupational group, 2007-2014



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 saw transfers increase from 8% to 14% of their gross income from 2007 to 2014. Of this 6-percentage point increase, almost 4 points are exclusively explained by active policy changes in the transfer system. Only in Hungary and Ireland there have been policy driven decreases in transfers.

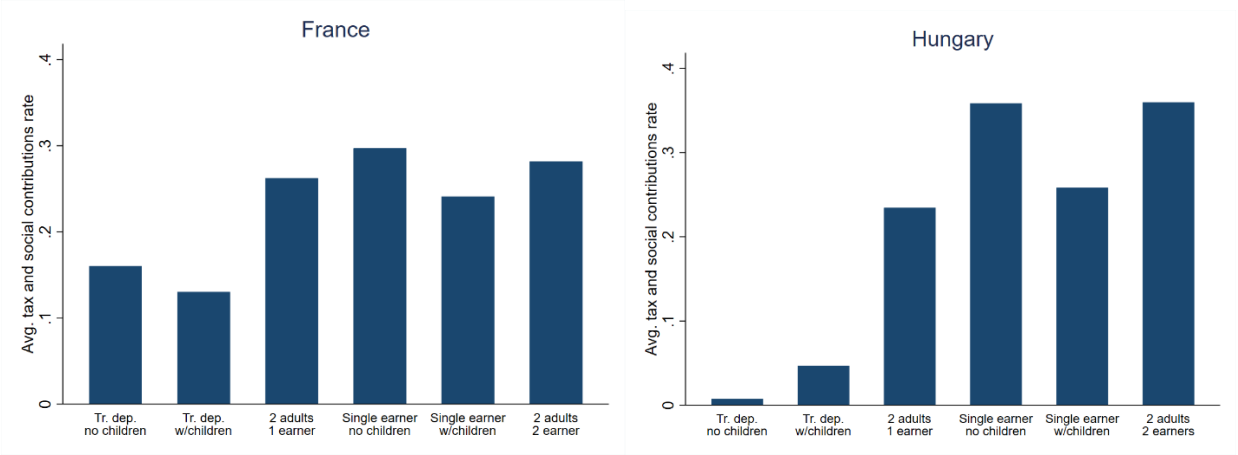
Overall, the picture that emerges from the analysis of the tax and transfer systems' across occupational groups is that the "losers" of job polarization – the shrinking routine task intensive occupations and the low paid non-routine, manual task intensive occupations –, if anything, are being partly compensated from the transfer side, but not so much by the tax systems – which, in

some cases, are even increasing the tax pressure on them more than for the "winners" of occupational change.

3.3 Across type of households

The middle class in Europe has been changing: the middle deciles of the income distribution have become more and more populated by pensioners, whilst 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 a more common household type Bussolo et al. 2018). To the point that some tax and transfer policies may benefit some income groups more than others, they may be also benefiting more some type of households than others. In this sense, it is relevant to analyze how the tax and transfer systems have affected households depending on their structure. For a matter of simplicity in this sub-section six types of households, that on average cover around 80% of the population, are analyzed: i) those composed of adults entirely dependent on transfer income, without children; ii) those composed of adults entirely dependent of 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, with labor income, and children -the single parent case-; v) those composed exclusively of one working adult, with no children -single independent adults- and vi) those with two adults, both with labor market earnings -the "dual earner" families.

Figure 14 – Different household-tax profiles across Europe
Average tax and social contributions rate by type of household, 2014

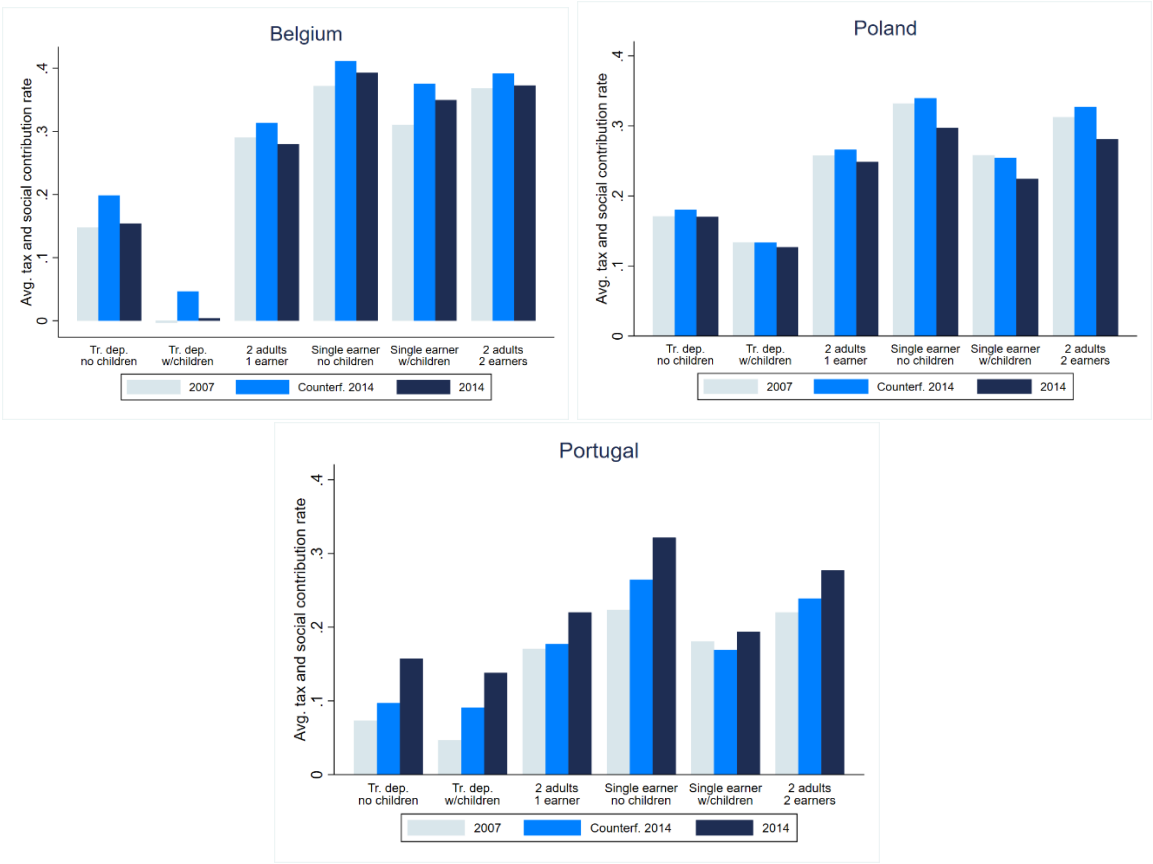


Note: Household types are the following: "transfer dependent" as households with one or two adults, all of them with no labor market earnings and depending on transfers, distinguished between those with and without children; "two adult, one earner" households, composed by two adults of which only one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

In Figure 14 we show two different profiles of tax rates across household types – the case of France, typical of most Western European countries, and the case of Hungary, typical of most Central and Eastern European countries. In France the lowest average tax rate is found for

transfer dependent households with children. In Hungary, the lowest average tax rate is found for households entirely dependent on transfer income without children. 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 no possibility of increasing household labor force participation, and in this sense the tax profile looks appropriate. In the case of those households with one earner but two adults, there is the possibility that the adult out of labor force -generally women- can enter the labor market and increase household income. Note however that the difference between the average tax rate paid between the lowest taxed group and the highest taxed group in France is close to 15 percentage points, whilst in Hungary is more than 30 percentage points. As in the case of 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 can be poorer in Hungary than in France, and this may be a reason for the difference in average tax rates. Looking at changes over time can nevertheless provide some information on the drivers of these static differences.

Figure 15 – Three examples of changes in average tax rate across household types
Average tax and social contributions rate by household type, 2007-2014



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.

Figure 15 shows the evolution of the household-tax profile over time in three European countries – Belgium, Poland and Portugal. The three of them with a similar profile in 2007. Average tax rates were lowest for transfer dependent households with children, followed by transfer dependent households without children. In 2014 this tax profile remained roughly the same, with tax rates on average higher in Portugal, and lower rates in Belgium and particularly Poland. The decomposition of the change between 2007 and 2014 with the use of counterfactual simulations shows, however, that tax systems changed differently in these three countries. In the case of Belgium, active changes in the tax system benefited transfer dependent households the most, whose tax rates would have been 5 percentage points higher had the system not changed. In the case of Portugal, this type of household -together with the single earner households with no children- was worst hit by changes in the tax system: 6 out of the 9 percentage points of the increase in average tax rate to transfer dependent household in Portugal are explained by active changes in the tax system. In the case of the Poland it was dual earner household who saw the biggest relative reduction in tax rates: had the system not changed, their average tax and social contributions rate would have increased from around 30% in 2007 to over 32% in 2014, but system changes brought it down to close to 27%. Transfer-dependent households saw the system decrease their tax rate by close to two percentage points, whilst single-earner households -particularly those without children- saw the system explain all of their tax rate decrease, between three and five percentage points. Among the countries whose tax system changes benefited mostly dual-earner households, like in Poland, there is Bulgaria, the Czech Republic, Hungary and the United Kingdom.

With respect to the analysis of transfer system, the evidence presented in the Annex shows that, excluding transfer dependent households, transfer 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. This profile is expected: household facing a bigger burden -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 not to have changed considerably across time.

The overall picture that emerges from the analysis of the effect of tax and transfer system across household types in Europe suggest that most of the changes have benefited those households that enjoy a greater degree of economic security, either because they rely on multiple sources of income from the labor market or on steady public transfers.

Conclusion

In this paper we have analyzed the nature of vertical and horizontal redistribution across the European Union countries. Traditionally, tax and transfer systems were designed with vertical redistribution as a main objective, and were judged based on how well did they perform on that dimension based on citizens' preferences. However, as Kanbur (2018) notes, if income is correlated with specific group attributes, any flow of vertical redistribution will also represent a flow in the horizontal sense, i.e. across groups. The evidence shows that changes in the tax and transfer systems of EU countries between 2007 and 2014 have had very different effects on horizontal redistribution: the young have been most affected by the introduction of "flat tax"

systems in several Eastern European countries, whilst occupational groups hit by job polarization have seen their taxes increase in many countries. Similarly, vulnerable households -those that rely on very few sources of income- have not been benefited as much as those that enjoy a greater degree of economic security.

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ANNEX

A.1 The EU tax-benefit microsimulation model EUROMOD

The analysis of the change in redistribution over time included in Chapter 3 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[5]. 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.

[5] 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.

A.2 Obtaining counterfactual income distributions using EUROMOD

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 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 $y-t$ to the market incomes and population characteristics in year t.[6]

Implementation steps in EUROMOD

The construction of the observed and counterfactual distributions is implemented for all EU-28 countries with EUROMOD H1.0+, using the most recent EUROMOD data files.[7] For most of the countries, the observed distributions of disposable incomes in t = 2014 are compared with the counterfactual distributions constructed with the tax/benefits system in $t-j$ = 2007.[8]

More technically, the implementation is conducted in the following steps:

(1) The EUROMOD system cc_{t-j} (e.g. at_2007 in the case of Austria) is copied, denoted as cc_{t-j}^*.
(2) The "best fit" data set is chosen to match the data set used by cc_t (at_2014). That is, the systems cc_{t-j}^* and system cc_t use the same data set.[9][10]
(3) To omit erroneous uprating, the reference year of system cc_{t-j}^* is set equal to the reference year of cc_t.
(4) Similarly, the exchange rate and currency parameters of cc_{t-j}^* are set equal to the ones of cc_t. This is relevant if there are currency changes between the years $t-j$ and t.
(5) The systems cc_{t-j}^* and cc_t are run. Note that there are no further changes in cc_{t-j} before running.

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

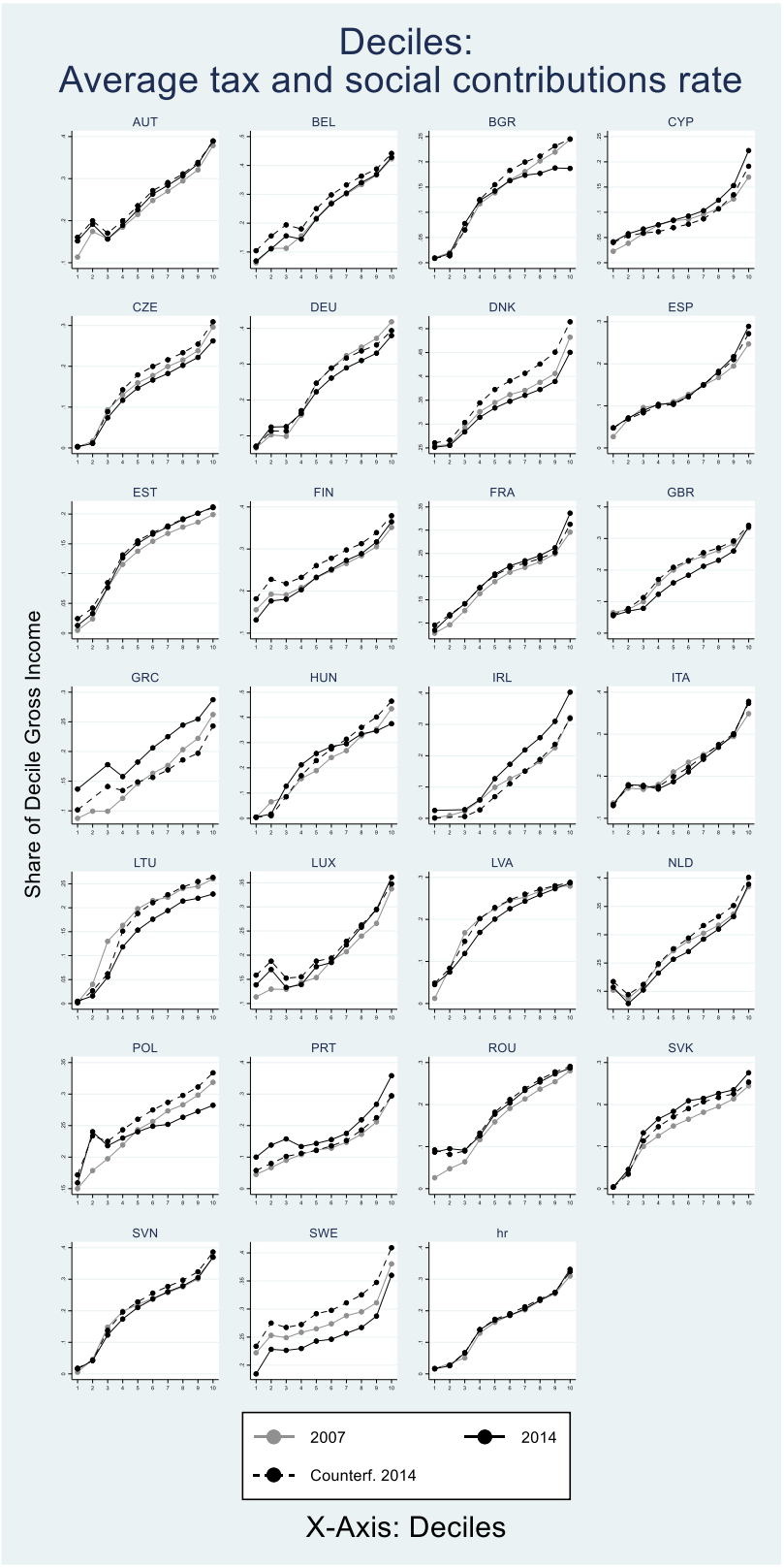
[7] The most recent data files as of 6th April 2018.

[8] See Appendix for a detail description.

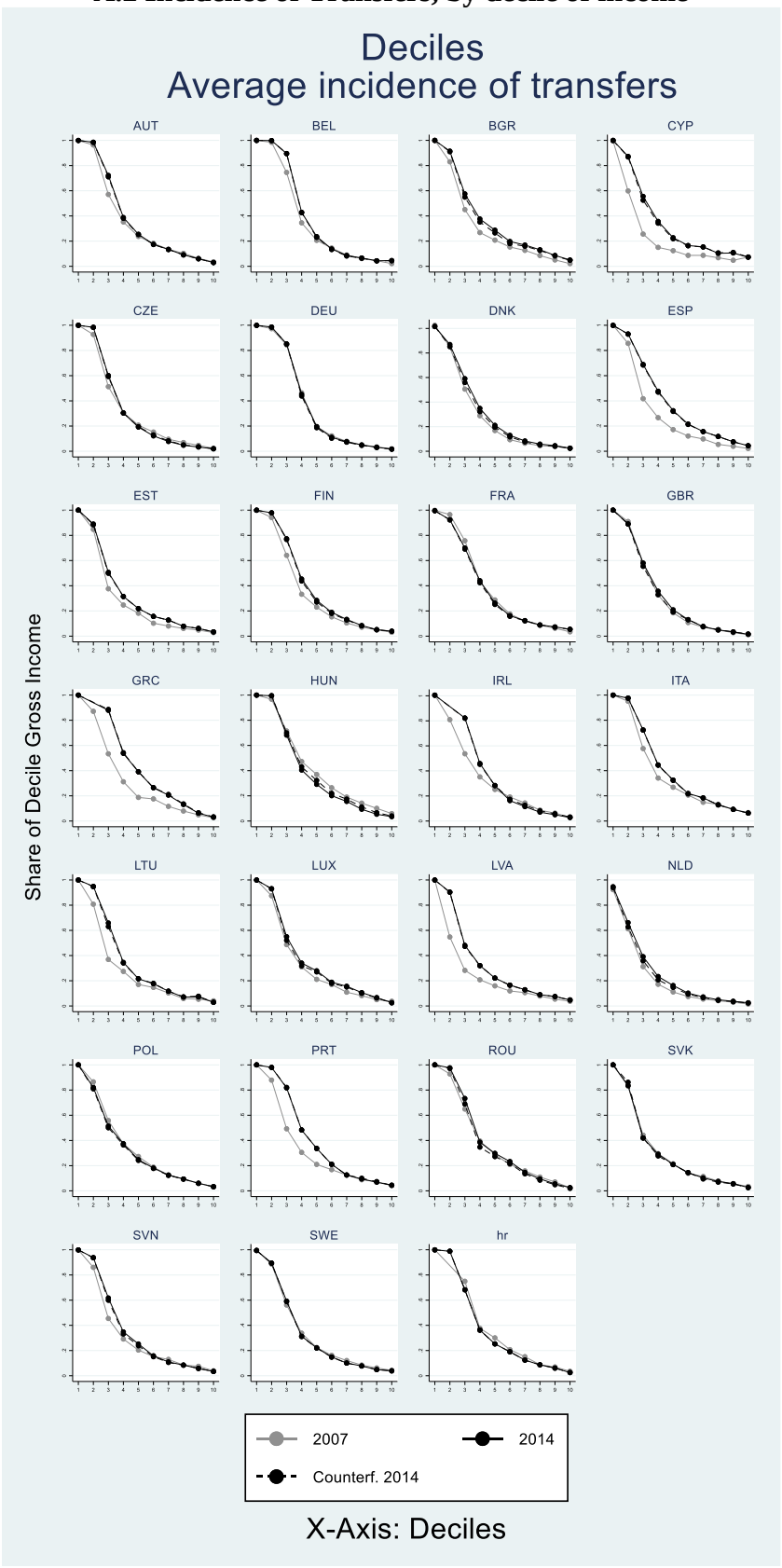
[9] Note that for most countries the input data set refers to the income year of the previous year (i.e. the 2015 input data refers to the 2014 income year).

[10] Whenever possible, the observed distributions are constructed using the income year that is equivalent to the tax/benefits system year (i.e. the 2015 input data, which contains information on the 2014 incomes, is used for the 2014 system).

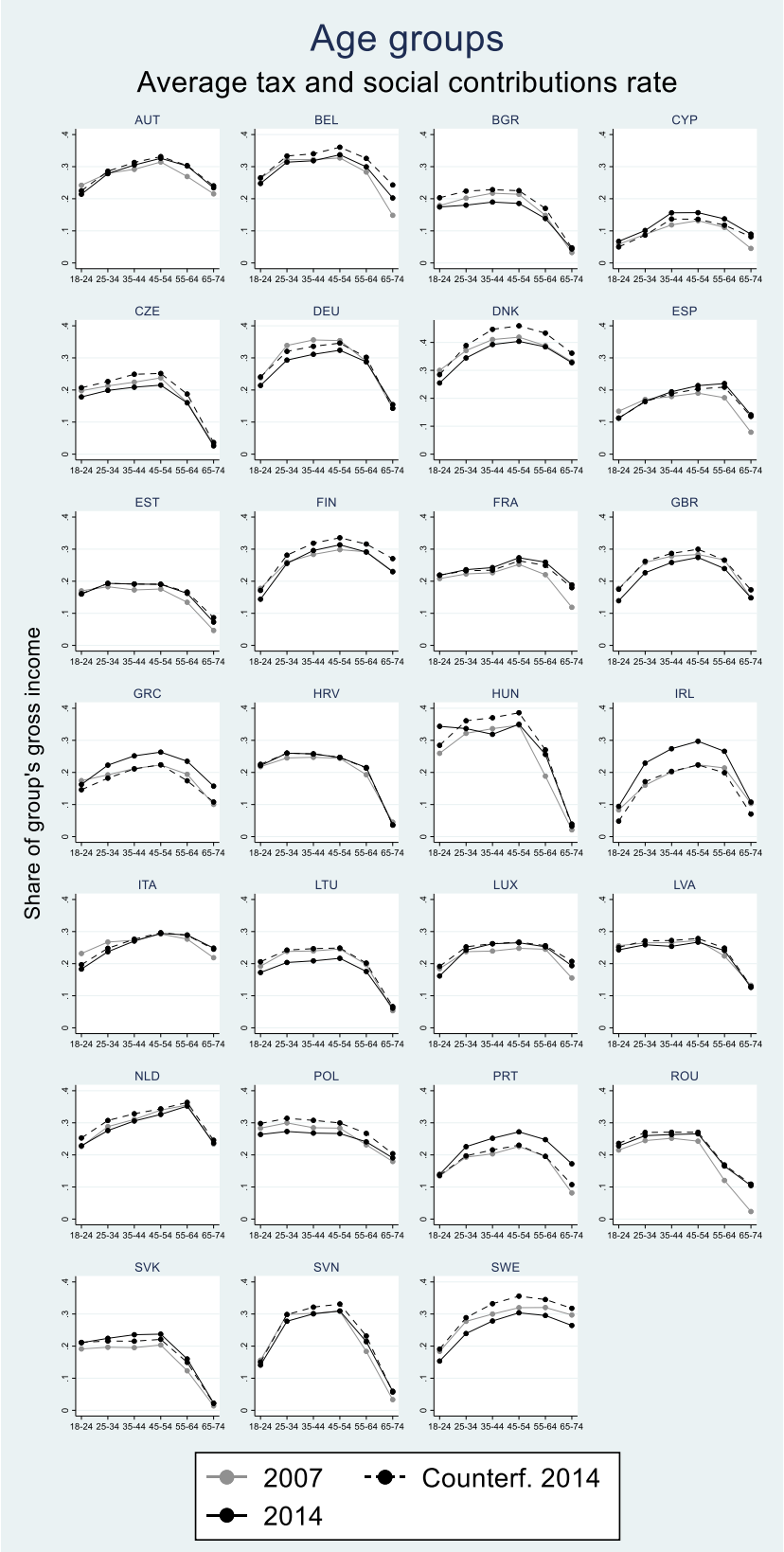
A.1 Incidence of Tax and Social Security Contributions, by decile of income



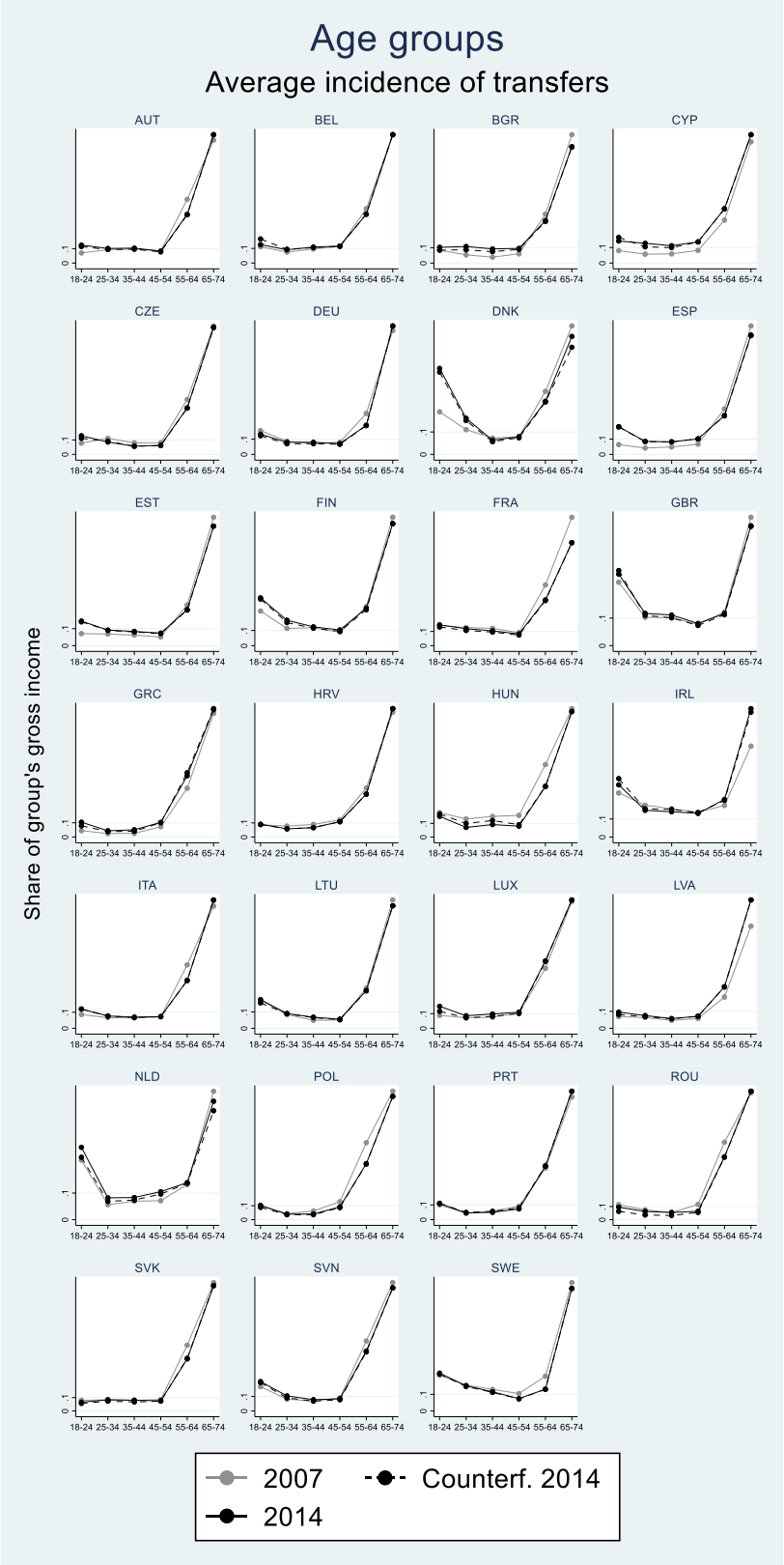
A.2 Incidence of Transfers, by decile of income



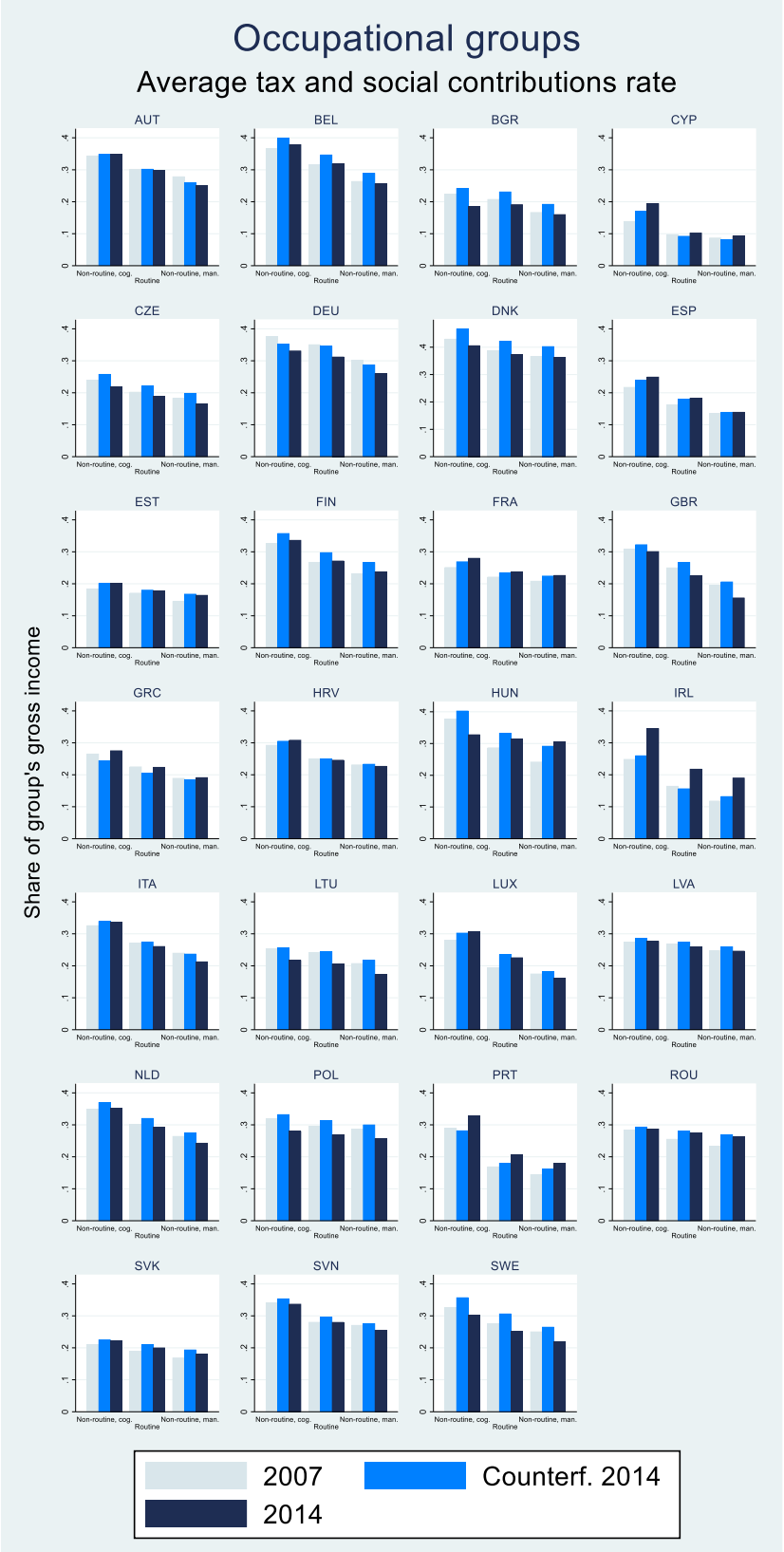
A.3 Incidence of Tax and Social Security Contributions, by age group



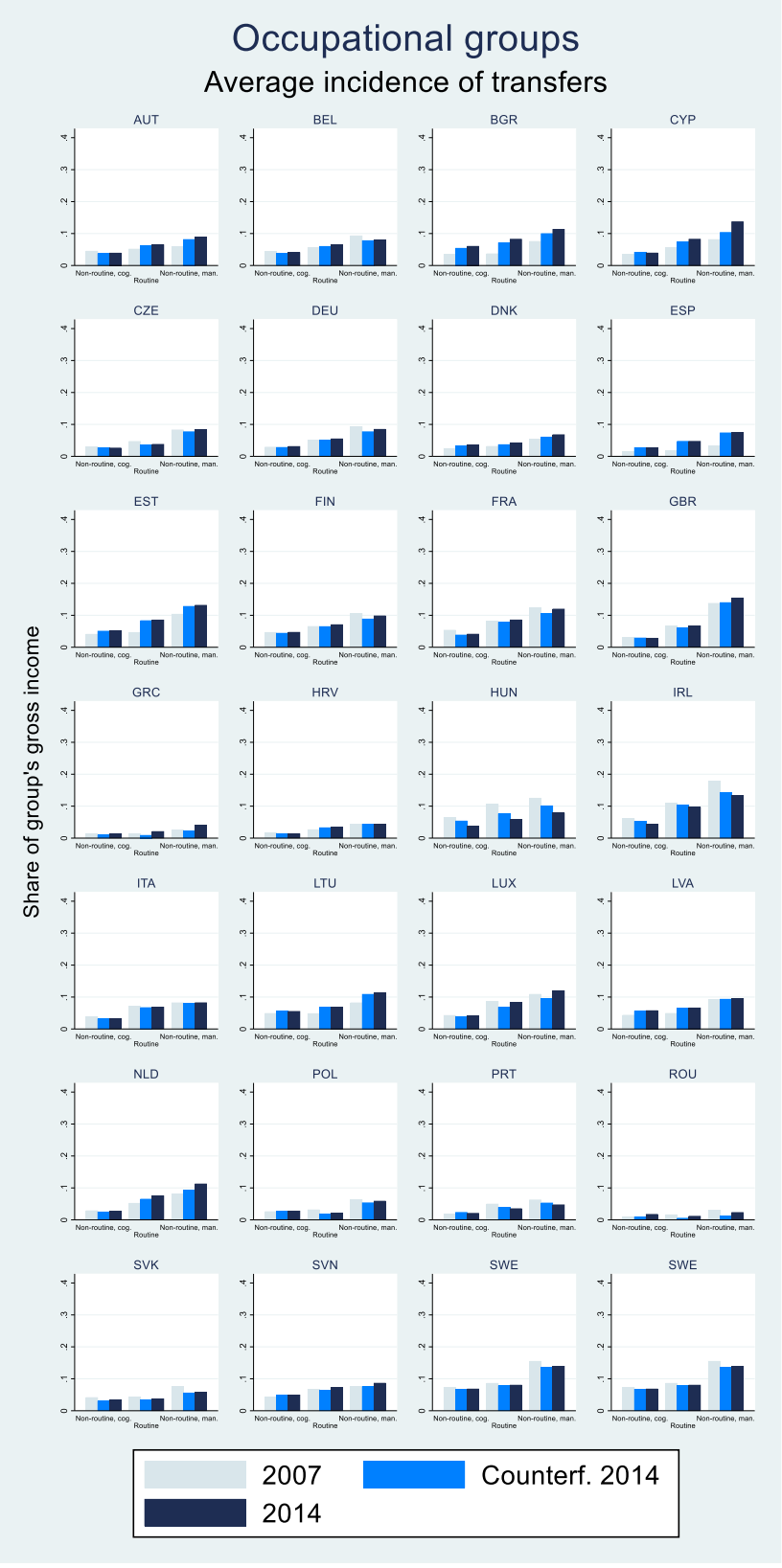
A.4 Incidence of Transfers, by age group



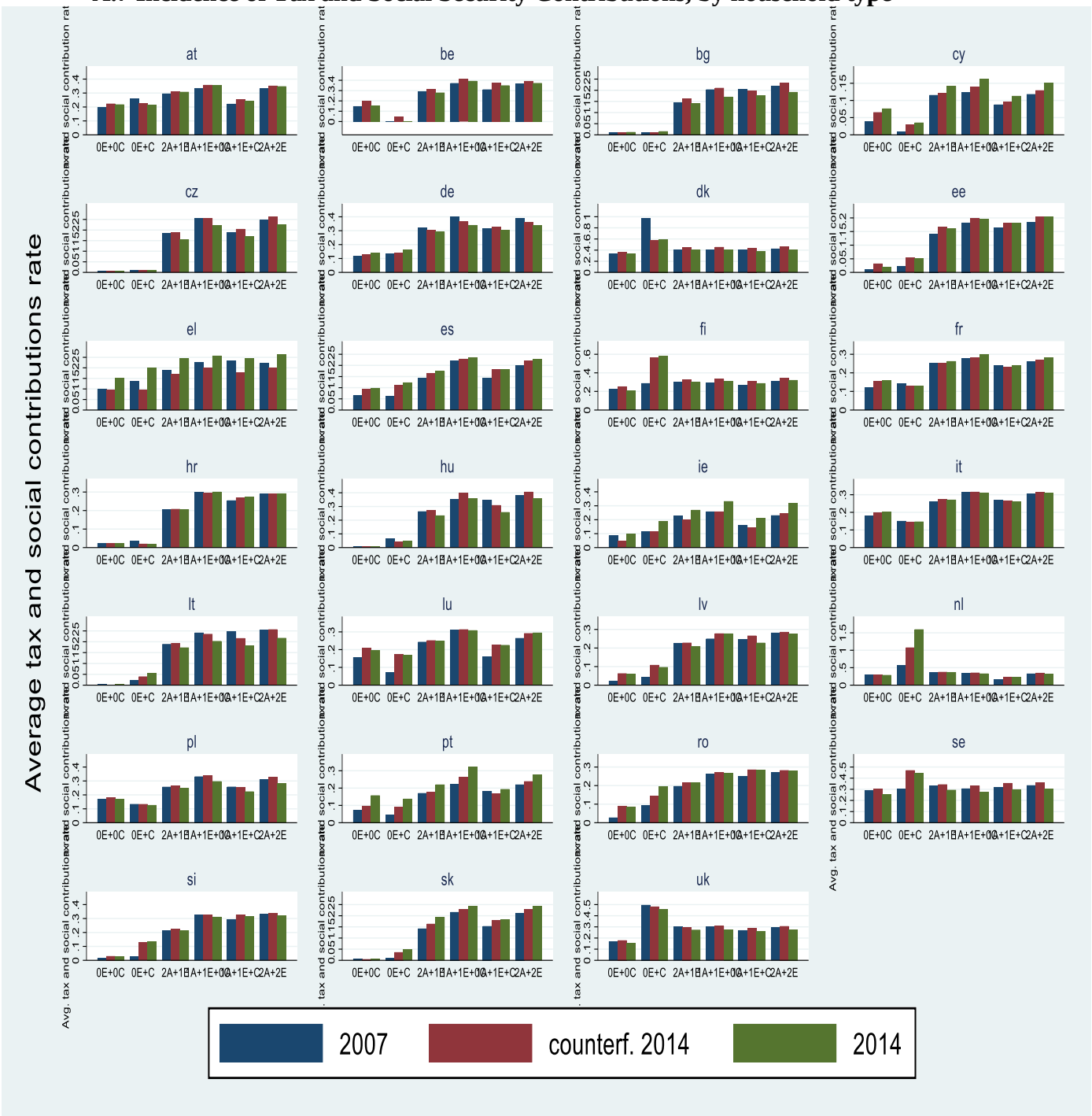
A.5 Incidence of Tax and Social Security Contributions, by occupational category



A.6 Incidence of Transfers, by occupational category



A.7 Incidence of Tax and Social Security Contributions, by household type



A.8 Incidence of Transfers, by household type


Average incidence of transfers
at
be
bg
cy
cz
de
dk
ee
el
es
fi
fr
hr
hu
ie
it
lt
lu
lv
nl
pl
pt
ro
se
si
sk
uk
Avg. transfer rate
0E+0C
0E+C
2A+1E+0C
2A+1E+C
2A+2E
2007
counterf. 2014
2014