

Guillaud, Elvire; Olckers, Matthew; Zemmour, Michaël

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Four levers of redistribution: The impact of tax and transfer systems on inequality reduction

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Four levers of redistribution: The impact of tax and transfer systems on inequality reduction

Elvire Guillaud* Matthew Olckers† Michaël Zemmour‡

April 7, 2017

Abstract

Using observational micro data from the Luxembourg Income Study (LIS), we assess the redistributive impact of tax and transfer configurations across 22 OECD countries for the period 1999-2013. After recovering new tax data (employer social contributions), we measure the reduction of income inequality due to the four structural dimensions of tax and transfer systems: the average tax rate, tax progressivity, the average transfer rate, and transfer targeting. Among the most remarkable results, we notice (i) the diverse combinations of taxation and transfers that achieve the same reduction in inequality; (ii) the absence of configurations that match strongly progressive taxation with a high rate of taxation; and (iii) the decisive impact of the rate of transfers relative to targeting.

Keywords: tax-benefit system; inequality reduction; social protection; redistributive policies
JEL: H23; H55; I38

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*University Paris 1 Panthéon-Sorbonne, CES, and LIEPP Sciences Po, elvire.guillaud@univ-paris1.fr

†University Paris 1 Panthéon-Sorbonne, and Paris School of Economics, matthew.olckers@gmail.com

‡University Lille 1, CLERSE, and LIEPP Sciences Po, michael.zemmour@univ-lille1.fr

1 Introduction

Scholars have highlighted four policy tools that affect income inequality: the average rate, and progressivity of taxation, and the average rate, and targeting of social transfers. The existing empirical literature provides an accurate assessment of the transfer side of redistributive policies, but the measurement and comparison of taxation remains either partial, or biased (Marx, Salanauskaite, and Verbist, 2013). We fill this gap by recovering new tax data, and analysing the impact of taxation and transfers simultaneously. Using Luxembourg Income Study (LIS) data, and additional imputed data, we decompose monetary redistribution into a function of the four policy tools. Our empirical analysis uses LIS harmonized household survey data to provide an international comparison of 22 countries over the period 1999-2013 (for a total of 67 country-years). To our knowledge, this is first cross-country study to compare the impact of taxation and transfers on redistribution in a unified framework.

The study of national configurations shows that no country combines all four tools (Koppi and Palme, 1998; Prasad and Deng, 2009). Although any mix of tax and transfers is theoretically feasible, only certain configurations are political feasible. Democracies face trade-offs between the different dimensions of redistributive policy. Using international comparisons, we assess the respective contribution of taxes and benefits in reducing monetary inequalities¹, and identify patterns of redistributive systems.

For transfers, most of the redistributive effect is due to the rate of transfers, while targeting plays only a marginal role. Although it would be theoretically possible, no country compensates a low transfer rate with sufficient targeting to match the level of redistribution reached by a high transfer rate. For taxation, both the progressivity, and the rate of taxation influence the level of redistribution. Different countries obtain the same level of inequality reduction through high rates of taxation, and through progressivity. However, strong progressivity is empirically correlated with a lower average tax rate, and therefore, government have reduced capacity to fund in-kind transfers, or a public pension system.

Our findings reveal patterns of policy configurations. No country utilizes the most redistributive features over all four dimensions, but we still observe a broad variety of arrangements. Interestingly, in no country do we observe the combination of a high redistribution through taxation, and through transfers. When excluding pensions to assess the redistributive impact of cash transfers, we find that most countries in our sample redistribute primarily through taxes. For every country-year in our sample, transfers are targeted at the poor (the rate of transfers decrease with market income), and the tax system is progressive (the tax rate increases with gross income)—only the intensity of targeting and progressivity varies across the sample.

¹Non-monetary forms of redistribution, such as in-kind redistribution, and occupational welfare, fell outside the scope of this analysis.

Our results hint at political trade-offs. First, highly progressive taxation appears incompatible with a high rate of tax. Second, the use of transfer targeting, and tax progressivity are strongly related to the level of market income inequality – more so than to other structural parameters of the system. We suggest that targeting and progressivity are substitutes for labour market regulation. Countries may choose to tax the rich and give to the poor as a substitute for maintaining a minimum wage, for example.

Our study contributes to the literature on the political economy of redistributive policies. Evidence suggests that countries in which transfers are most concentrated are less effective in reducing inequality (Korpi and Palme, 1998; Moene and Wallerstein, 2001), which is referred to as the ‘paradox of redistribution’. The importance of the size of transfers is well supported, but the existence of a negative relationship between targeting and redistribution is contested (Brady and Bostic, 2015; Marx, Salanauskaitė, and Verbist, 2013). We find a positive relationship between targeting and redistribution. Yet, we show that the impact of targeting is in fact moderate, and conditioned by the average size of transfers.

Our study also refers to the economic literature measuring the impact of tax and transfer on inequality reduction. While few studies compare the redistributive impact of the tax-benefit systems in an encompassing manner, their conclusions all point in the same direction. The redistributive effect of transfers is much more important than the tax system (Immervoll and Richardson, 2011; Kenworthy, 2011; Joumard, Pisu, and Bloch, 2012; Avram, Levy, and Sutherland, 2014). With the exception of Immervoll and Richardson (2011), these studies do not disentangle the specific effect of targeting and progressivity as we do.²

The finding that transfers achieve on average higher redistribution than taxes is primarily due to state provided pensions, which inflate the level of transfers (Immervoll et al., 2006). Our study shows that if public pensions are categorised as market income rather than transfers, the redistributive effect of transfers is dramatically reduced, and falls below the redistributive effect of taxes. Pensions are not the only factor that distort the comparison between transfers, and taxes.

We argue that measures of tax redistribution suffers from a severe bias in studies based on LIS data. Personal income tax, and employee contributions are included, but employer contributions is excluded arbitrarily. This is a major problem, since the balance between employee, and employer contributions varies significantly across countries. In this study, we overcome this bias, and provide an accurate measure both of tax and transfer redistribution.³ The imputations cover 52 percent of the national tax revenue – in contrast to 35 percent in the initial LIS data. No single country-year has coverage below 35 percent, whereas it was the case for half of the sample in the initial LIS data. Thus, we significantly

²Immervoll and Richardson (2011) restrict their analysis to the non-elderly, and exclude taxes and contributions paid by employers.

³The remaining of the tax revenue is mostly due to consumption tax, and corporate taxation. We study consumption tax in a companion paper

reduce the bias in the measure of tax redistribution.

The following section describes our framework for decomposing redistribution into the four policy tools. Section 3 describes the data, and details the imputations of social security contributions. Section 4 provides the results of the international comparisons, which have been summarised with a range of graphs. We conclude, in Section 5, with a discussion of the results, and recommendations for future research. Analysis of the redistributive impact of pensions, and further details of the imputations are available in the appendix.

2 Four levers of monetary redistribution

Our analysis of monetary redistribution is sequential (see Figure 1). We first add transfers, which converts *market income* to *gross income*; then we apply fiscal redistribution (through taxes) to obtain *disposable income*.⁴ The advantage of this sequential approach, used in conjunction with the formula below, is that it allows: (i) comparing fiscal redistribution (due to taxes) with social redistribution (due to transfers) for each country-year observation; and (ii) comparing the four levers of redistribution over time and over space. A limitation is that the variables of the first and second terms of the equation are not comparable. The tax progressivity is not comparable with the targeting of transfers. Similarly, the tax rate is not comparable with the transfer rate. However, we can compare the magnitude of changes in inequality due to taxes, and due to transfers.

The work of Reynolds and Smolensky (1977) and Kakwani (1984), used by the empirical literature on tax and transfer systems, identify the links between redistribution, progressivity (or targeting), and the average rate of taxes (or transfers). We rewrite these results in a form that contains the four levers of redistribution in a single formula, shown below. The greater the transfer rate and the more intensely these transfers are targeted to the poor, the greater the redistribution.⁵ Similarly, the greater the tax rate and more intensely progressive the tax system, the greater the redistribution.

$$\begin{aligned} \text{Redistribution} &= \text{Tax rate} * \text{progressivity} + \text{Transfer rate} * \text{targeting} - \epsilon \\ G_{\text{market}} - G_{\text{disposable}} &= \frac{t}{1-t} K_{\text{tax}} + \frac{s}{1-s} K_{\text{transfer}} - \epsilon \\ G_{\text{market}} - G_{\text{disposable}} &= \frac{t}{1-t} (C_{\text{tax}} - G_{\text{gross}}) + \frac{s}{1-s} (C_{\text{transfer}} - G_{\text{market}}) - \epsilon \end{aligned}$$

⁴Since we are interested in the general structure of redistribution at the country level, we consider the tax system, and the transfer system as aggregates, and do not analyse the specific contribution of different schemes.

⁵For convenience, we use the term “targeting”, but the proper concept would be “degressivity”: the intensity to which the transfer rate (transfer/ income) is a decreasing function of income.

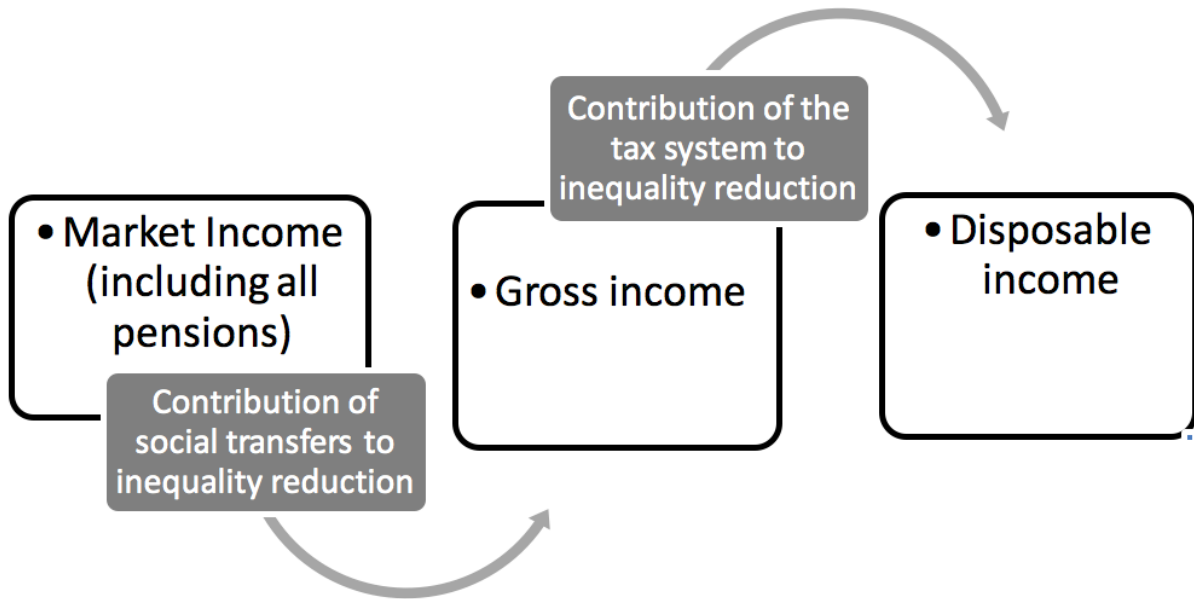


Figure 1: Sequential contribution of the tax and benefit system to inequality reduction.

Redistribution is measured by the difference between the Gini index on market income, and the Gini index on disposable income – an extension of the Reynolds-Smolensky index. The impact of the tax rate is measured by $\frac{t}{1-t}$, where t is the average tax rate. This form is due to algebraic relationship between Reynolds-Smolensky index, and the Kakwani index. Similarly, the transfer rate is measured by $\frac{s}{1-s}$, where s is average transfer rate. K_{tax} and $K_{transfer}$ are the Kakwani indexes to measure progressivity, and targeting respectively. The Kakwani index is the difference between the concentration coefficient, C , and the Gini index, G . Concentration coefficients are calculated on pre-tax income for C_{tax} , and pre-transfer income for $C_{transfer}$. As shown by Kakwani (1984), ϵ , also known as the Atkinson-Plotnick index of re-ranking, captures the change of household ranking in the income distribution, induced by the fiscal process.⁶ (The i th poorest household according to market income, may not be the i th poorest household according to disposable income.)

The formula has the advantage of allowing a decomposition of the redistribution into separate elements. The equation shows that, in theory, redistribution depends on the interaction between average rate, and progressivity (or targeting). The marginal effect of progressivity is not constant. For example, an increase in progressivity will have a larger impact of redistribution when coupled with a higher average tax rate. The converse also applies. The marginal effect of the average tax rate varies according to the level of

⁶ See Urban et al. (2009) for details on inequality decomposition and reranking.

progressivity observed. Ultimately, identifying the marginal effect of changes in the average rates, progressivity, and targeting is an empirical question.

3 Data

3.1 The LIS dataset

We use the micro data provided by the Luxembourg Income Study (LIS), a harmonisation of national household surveys. Data includes different types of household income, comprising individual earnings, and social transfers in cash, along with direct taxes, employee contributions, and household consumption behaviour.

LIS data has become the scientific reference for the analysis of the redistributive impact of socio-fiscal systems. It has the advantage of being comprehensive, comparable, and of capturing the behavioural effect of the transfer system – since the recipient reports the amount of transfers actually received rather than the amount the government intends to provide. Employee social security contributions, and personal income tax is measured for most country-years, but not all. Employer social security contributions, and taxes on consumption (such as VAT) are missing for all country-years.

3.2 Details on income measures

Taxes and transfers may be separated from labour and capital income to define five types, or stages, of income. *Primary Income* measures income before any taxes, but excluding pensions. *Market income* results from adding pensions, and then *gross income* results from adding social transfers. Subtracting income tax and social security contributions provides *disposable income*, and, finally, subtracting tax on consumption results in *net disposable income*. The detail of LIS variables used at each income stage can be found in Table 1 in the Appendix. In this paper, we focus on the change from market, to gross, to disposable income – the impact of transfers, and taxes.

All income, tax, and transfer variables are standardized at the household level using the square root equivalence scale. We always compare transfers to market income, and taxes to gross income. This is consistent with most legislation, since eligibility criteria to cash transfers refer to market income, while the tax base includes part of transfer income.

For each country-year, we extract the Gini inequality index for each income concept, the Kakwani index to measure the progressivity of taxation, and the intensity of targeting of social transfers, and average rates of taxation and transfers over household income. The choice of income concept can influence the Kakwani index. In previous studies, the reference income is market income. We maintain this convention.

Two choices of measurement are particular to our analysis. Firstly, we choose to include retirement pensions (including occupational and universal pensions, but excluding assistance pension) in market income. We acknowledge that public pensions contribute to the reduction of inequality, but their role must be studied separately. The difference between public and private pensions poses problems of comparability. Two options exist in the literature: (i) restrict the analysis to the working age population, (ii) integrate public pensions into market income, just like private pensions. We choose the second option. Doing so, the market income of pensioners is comparable between countries with funded pensions and countries with pay-as-you-go systems. Our sample frame thus includes the whole population in contrast to the majority of studies which reduce their sample to working age population.

By including pensions into market income, we do not consider pensions as social transfers. A rationale for excluding pensions while measuring transfer systems is that pensions might be considered as being equivalent to a deferred income, which is not the case for other benefits covering social risks like unemployment or sickness.⁷ As a complement, we also run a specific analysis of the redistributive impact of pensions (see Appendix A). Our analysis confirms that public pensions is a major determinant of inequality reduction between households.

The second measurement approach particular to this study is that we measure market income gross of employer social security contributions. There is no economic difference between employer, and employee social security contributions. According to the literature on social contributions, the majority of the incidence (between two thirds, and 90 percent) falls on the employee, even though the contributions are labeled as employer social security contributions (for a review, see Gruber, 1997; Melguizo and González-Páramo, 2013). As such, the incidence of social contributions is similar to personal income tax, so there is no economic reason to treat personal income tax, employer contributions, and employee contributions differently. This choice is made to ease comparability, as the split between employer and employee contributions varies from one country to another. Notice in Figure 2 that many countries, such as Sweden, rely mostly on employer contributions, while other countries, such as the Netherlands, rely on employee contributions. We group social contributions with income taxes, which is consistent with the OECD Taxing Wages series, and studies by Immervoll et al. (2006), and Avram, Levy, and Sutherland (2014).

⁷Note that pension contributions are included in the analysis, while their counterpart, pension payments, are excluded from transfers. Indeed, it is not possible with the data available to distinguish pension contributions from other contributions.

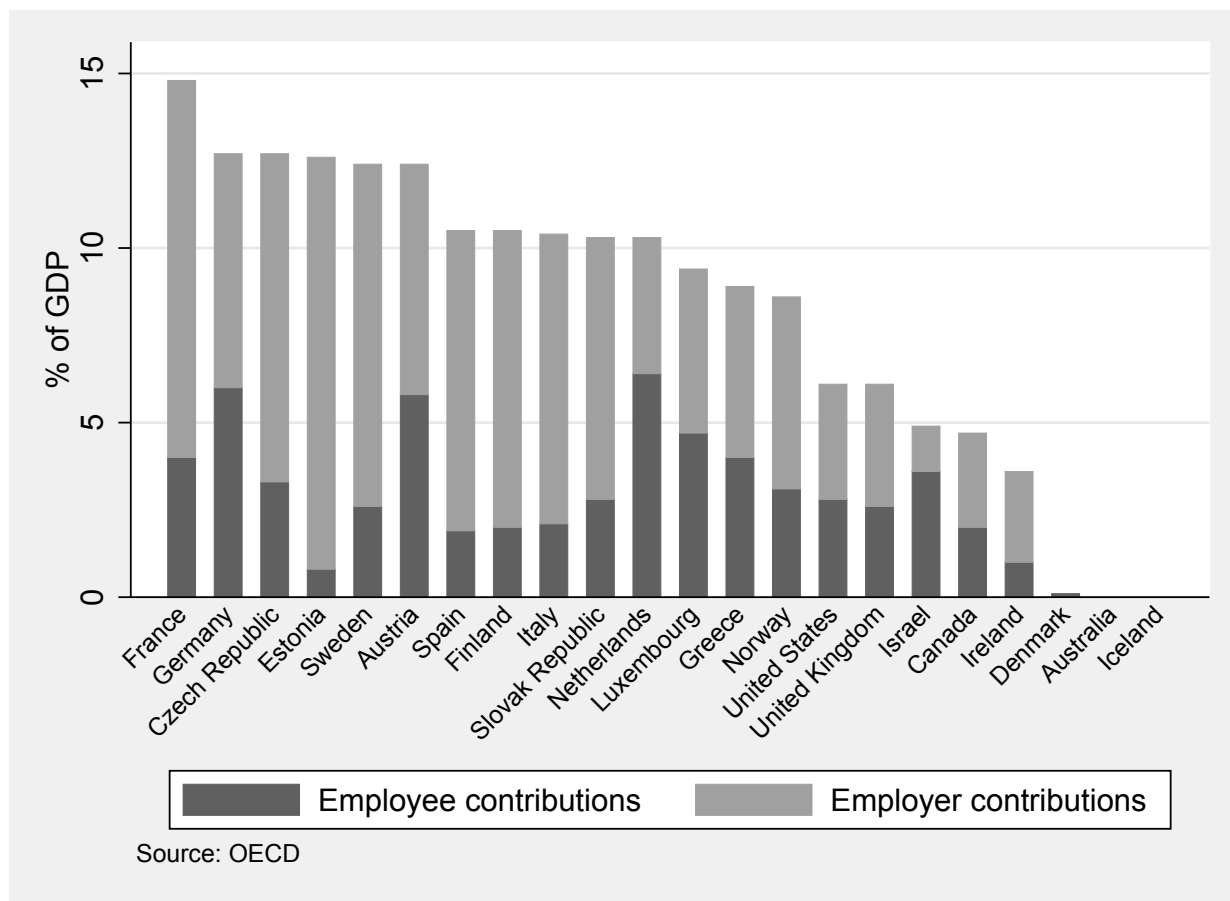


Figure 2: Split between employer and employee social security contributions.

3.3 Imputation of social contributions

As shown in Kato (2003), or Beramendi and Rueda (2007), a large part of social transfers is financed through indirect taxes such as social contributions from employers, and tax on consumption. Measuring the effects of transfers without measuring the effects of taxes which fund these transfers strongly distorts the measure of redistribution. In addition, exemptions from social security contributions, especially on low wages, has become one of the strongest elements of progressivity in the tax system in countries such as France, and Belgium (Zemmour, 2015).

We impute employer social contributions, which is a major tax component, but is not documented in the LIS data. Using OECD data on statutory rules, we impute the effects of employer social contributions in a systematic manner at the individual level. Our imputation greatly improves the tax coverage of the dataset. We cover 52 percent of the national tax revenue on average, with a minimum of 35 percent. The original LIS data covers 35

percent on average, with a minimum of 18 percent.⁸ Figure 3 shows the effect of imputing social security contributions on the distribution of tax coverage. For some countries, we also impute employee contributions, and personal income tax.⁹

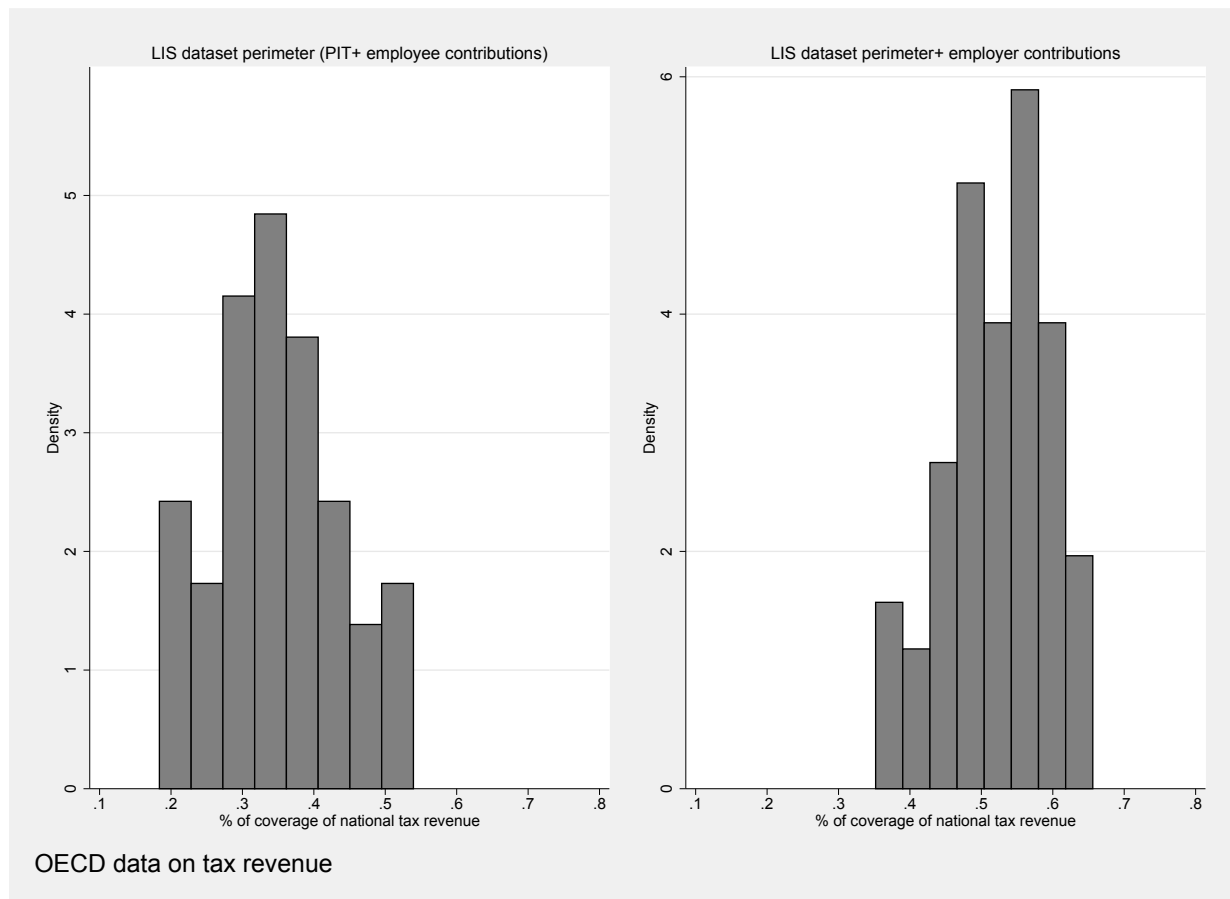


Figure 3: Tax coverage before, and after imputation of employer social security contributions.

To impute employer social contributions, we use individual wages, and apply the statutory rates provided by the OECD Taxing Wages series. To the extent that the wages are accurately measured, the application of statutory rates allows for correct imputation, and serves to simulate the amount of employer social contributions. When separate measures

⁸This is the theoretical LIS coverage. The actual LIS data of our sample has even a lower coverage, since *employee* contributions are missing in France, and Italy

⁹Since most studies tend to mix the different types of datasets (net, gross and mixed) without further analysis, the recovery of employee contributions and personal income tax is an important improvement in welfare state research. For this reason, we plan to make this data available online for scholars in the field. For this paper, we use only the gross, and mixed datasets, and exclude the net datasets (ie. country-years for which even personal income tax is missing).

of personal income tax, and employee social security contributions are not available, we impute employee social security contributions by the same method. Our imputations allow us to reconstruct the primary labour income of each individual. Finally, imputed measures are aggregated to the household level.

3.4 Variables of interest

Our variables of interest are the four levers of income redistribution identified in Section 2: tax rate, tax progressivity, transfer rate, and transfer targeting.

Tax and transfer rates are calculated by dividing the mean level of taxes and transfers by the mean level of household gross income, and market income respectively. Note that tax and transfer rates are not directly comparable because the denominator differs.¹⁰ We select the denominators so that we can decompose redistribution using the formula mentioned above.

Following Prasad and Deng (2009), we use the Kakwani index (Kakwani, 1984) rather than the concentration index to measure tax progressivity, and transfer targeting. The concentration index summarizes the distribution of a variable over households, ordered according to their income. This measure is sensitive to the initial level of inequality, so the Kakwani index provides a correction by subtracting the Gini index from the concentration index. For transfers, the lower the Kakwani index, the greater the intensity in which transfers increase as income decreases. The index ranges from $-1 - G$ to $1 - G$, where G is the Gini index. The transfer system is redistributive when the index is negative. For taxes, the higher the Kakwani index, the greater the intensity in which the tax level increases as income increases, and the tax system is redistributive when the index is positive.

4 Results

4.1 Comparing the impact of transfers, and taxes on inequality reduction

By computing the Gini index at different income stages, we assess the reduction in inequality due to transfers, and due to taxes for each country-year in our dataset. The comparative impact of taxes and transfers is shown in Figure 4, where the step from market to gross income is due to transfers, and the step from gross to disposable income is due to taxes. In most countries, taxation makes a stronger contribution to inequality reduction than transfers (excluding public pensions). There are notable exceptions, such as UK, Ireland,

¹⁰ We analysed the robustness of the results to the modification of this convention by calculating all rates on the same reference income. The results are preserved.

or Denmark, for which there is a large reduction in inequality due to transfers relative to the reduction due to taxes.

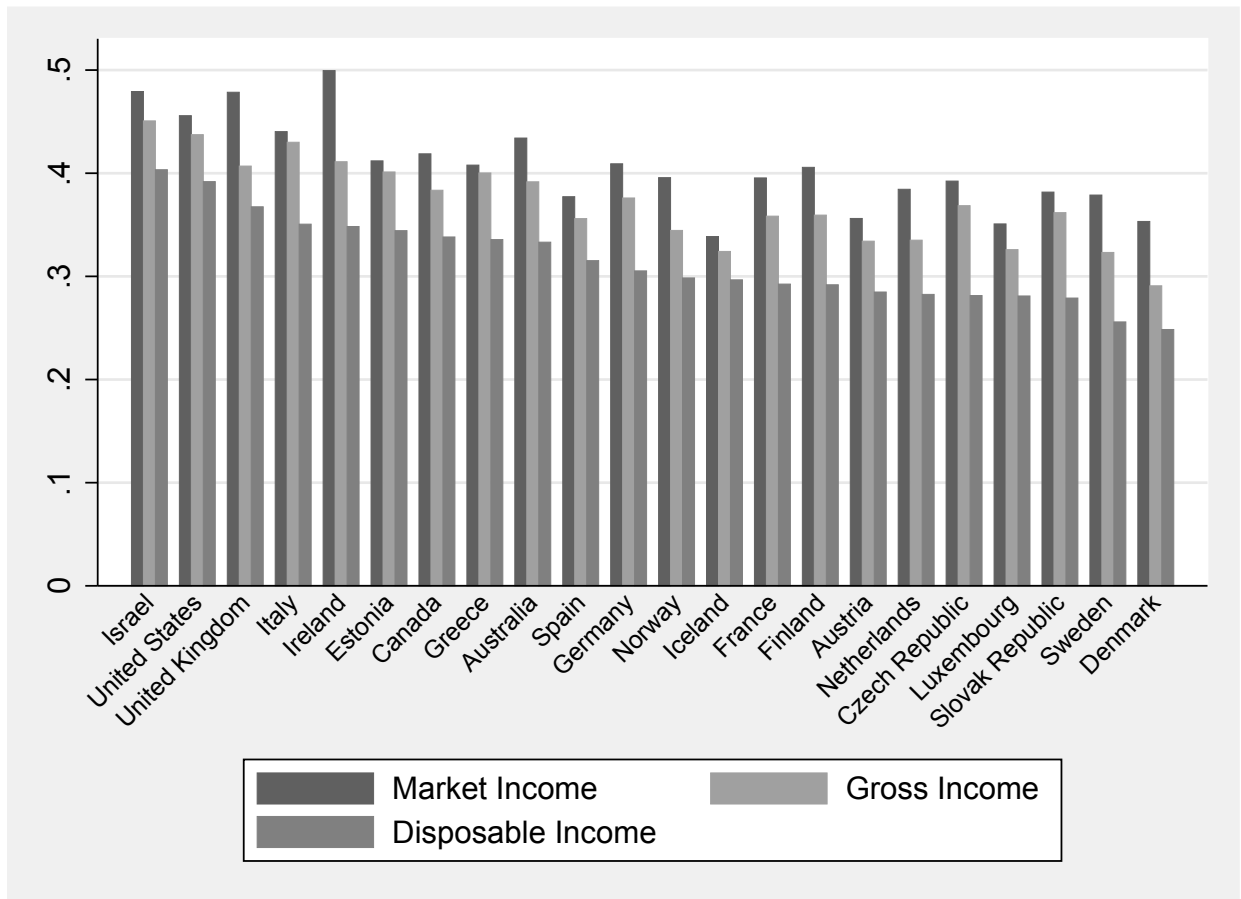


Figure 4: Inequality (Gini coefficient) at different income stages.

Note: Countries are ranked in decreasing order of disposable income inequality. Data refers to year 2004, except for except for Australia (2003), France and Sweden (2005), Greece, Island and Spain (2007), Estonia and Israel (2010).

Our data confirm a stylistic fact that the main predictor of disposable income inequality is market income inequality. The impact of taxes and transfers is not strong enough to remove the correlation between market income inequality and disposable income inequality, which is 0.80 in our sample. Taxes and transfers do reduce inequality, but countries with high market income inequality also, generally, have high disposable income inequality.

Figure 5 provides more detail on the different combinations of taxes and transfers. It shows the relative contribution of the tax system and the transfer system to global inequality reduction – from market income to disposable income. The downward sloping lines correspond to various levels of global inequality reduction. The upward sloping line is the

45 degree line where the reduction in Gini coefficient due to transfers is equal to reduction in the Gini coefficient due to taxes. One can identify two large clusters of countries, based on the global level of inequality reduction: low and high level of inequality reduction.

In the low reduction cluster of countries, the Gini coefficient decreases by approximately 0.07 between market income, and disposable income. This cluster includes Canada, Israel, Luxembourg, Spain, Austria, US, Estonia, Greece. In this group, tax redistribution always exceeds transfer redistribution. The tax reduction is centered around 0.05 points, and the transfer reduction is centred around 0.02 points of the Gini index.

In the high reduction cluster of countries, the Gini coefficient decreases by about 0.11 between market income, and disposable income. This cluster includes UK, Denmark, Norway, Netherlands, Australia, France, Germany, Italy, Sweden, Finland, Czech Republic and Slovakia. In this group, a broad range of arrangements lead to the same level of inequality reduction. A small number of countries (UK, Denmark, Norway) displays a dominant role for transfers. In other countries, the role of taxes is more dominant than transfers. At the extreme, in the Czech Republic, Slovakia, and Italy the tax system contributes to more than 75 percent of the inequality reduction. Iceland, and Ireland are outliers in this breakdown, with a remarkably low, and high level of inequality reduction respectively.

These results differ from the results based on the original LIS data. (Appendix B displays the comparison.) The inclusion of employer social security contributions raises the average contribution of the tax system to inequality reduction, and slightly diminishes the role of the transfer system. Czech Republic, France, Iceland, Norway, Slovakia, and Sweden are very sensitive to the imputations. In contrast, the position of certain countries, such as Denmark, and Canada, remains unchanged. The inclusion of employer social security contributions not only changes the redistribution measure, but also reveals a bias in the analysis of the national structure of redistribution. The original data will overemphasize the role of the transfer system for a subset of countries.

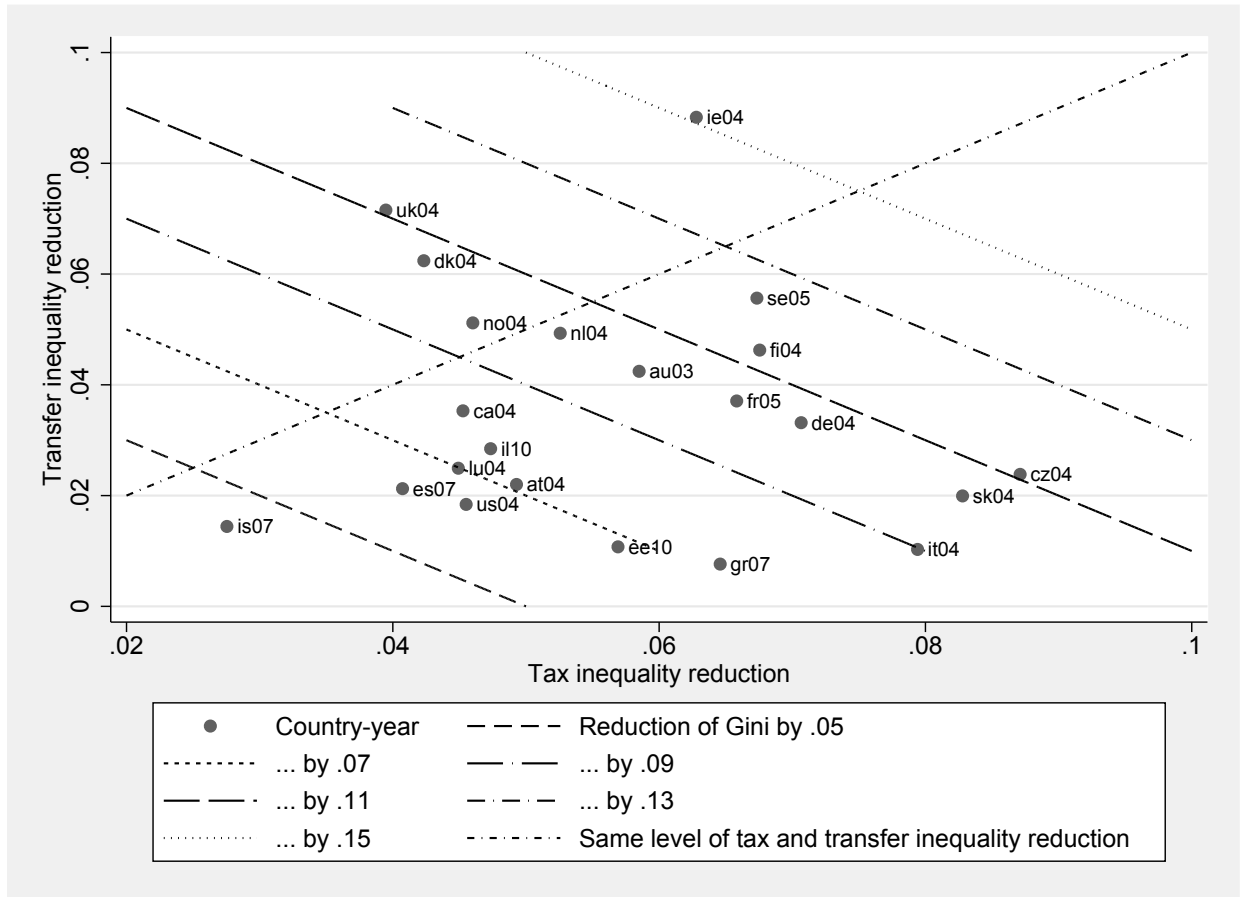


Figure 5: Tax and transfer contribution to inequality reduction.

Note: The vertical axis indicates the effective social reduction of inequalities between the market income and the gross income (Reynolds-Smolensky index). The horizontal axis shows the effective tax reduction of inequalities between the gross income and disposable income. Parallel downward sloping lines indicate the levels of actual inequality reduction achieved by the system as a whole, between market income and disposable income (iso-levels of inequality reduction). Countries below the 45 degree line are countries where taxation reduces inequalities more than transfers. For example, in 2004 a social reduction of inequalities of 0.07, a tax reduction of inequalities of 0.04, and an effective redistribution (Gini variation) of 0.11 between the market income and disposable income is measured for the United Kingdom.

4.2 Inequality reduction by transfers

Our data allows us to analyse the contribution of both the average rate of transfers, and the intensity of targeting to inequality reduction. Figure 6 provides the decomposition. Similar to Figure 5, the downward sloping lines represent different levels of inequality reduction. The inequality reduction is greater as you move to the top right of the graph. Notice that transfers decrease with income, since the targeting index is negative for all country-years. There is broad variation of the intensity of targeting across the sample. The Kakwani index varies from -1.05 to -0.35, with a mean at -0.77 and a standard deviation of 0.14. Notice that Ireland and UK lie at the extreme. These two countries combine intensely targeted transfers with a high average rate of transfers.

The impact of targeting is constrained by the average rate of transfers. USA-2004 targets far more intensely than Iceland-2007, but both have a low average rate of transfers (around 2.5 percent of market income), which results in little difference in redistribution. Said simply, targeting has little impact when there is little money to distribute. Conversely, at a much higher level of transfers (around 10 percent of market income), the difference in targeting between the strong targeting in UK-2004, and the weak targeting in Sweden-2005 results in a significantly greater inequality reduction for UK-2004. We can interpret this relationship with the equation detailed in Section 2. Targeting is multiplied by the transfer rate to determine the vertical redistribution, thus the redistributive effect of targeting is conditional on the transfer rate.

Our results contribute to the existing literature on the 'paradox of redistribution' (Korpi and Palme, 1998). The transfer rate has a larger impact than targeting. Theoretically, the same level of redistribution may be achieved by different combinations of transfer rates and targeting, but the observed transfer rates are too low for targeting to have a major impact. At the level of transfer rates and targeting we observe, one standard deviation change of the transfer rate brings about much larger (2.5 times more) redistribution than one standard deviation change in targeting. In the full sample, one standard deviation increase in the intensity of targeting increases redistribution by 0.008 points (20 percent of average social redistribution), while one standard deviation of the transfer rate increases redistribution by 0.020 points (50 percent of average social redistribution).¹¹

¹¹Marginal effects are calculated leaving other parameters at their sample mean. Calculation performed on 67 observations, and robust to various sub-samples (eg excluding year 2010, or using cross-section sub-samples). The average vertical social redistribution is 0.042; one standard deviation of targeting is 0.14; one standard deviation of transfer rate is 0.03. See Appendix C for a comment on the redistributive impact of extreme values of tax progressivity and transfer targeting.

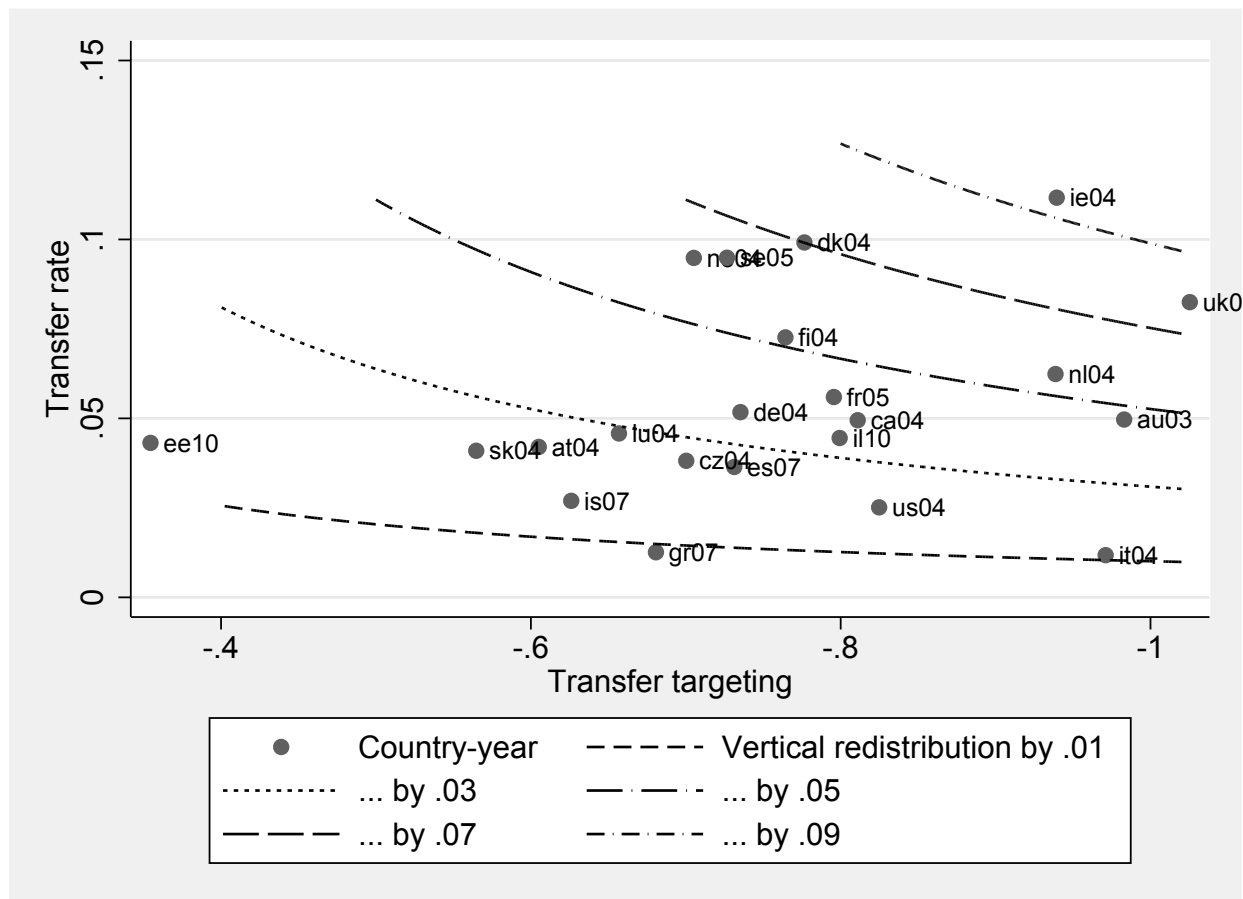


Figure 6: Vertical redistribution by transfers: level versus targeting.

Note: The average transfer rate is indicated on the vertical axis, and the targeting index (Kakwani index) is indicated on the horizontal axis. The closer the targeting index is to zero, the less benefits are targeted to poor households. The downward sloping lines represent the resulting vertical redistribution (iso-levels of vertical inequality reduction). Two points on the same level line represent the same vertical social redistribution obtained by different combinations of average rates and targeting. This vertical redistribution does not take into account the possible re-ranking effect, and might thus slightly overstate the actual social redistribution. For example, in 2004, Denmark had a transfer rate of 10 percent of market income and a targeting of -0.78, resulting in a vertical social redistribution of 0.07 Gini points.

4.3 Inequality reduction by taxes

Figure 7 shows the decomposition of inequality reduction due to the average tax rate, and due to progressivity of taxes. The redistribution achieved ranges from 0.03 to 0.10 points of the Gini index. One can read, for instance, that USA-2004 and Australia-2003 have similar average tax rates (24 percent, and 23 percent respectively), but Australia displays a much more progressive tax system. Therefore, USA reduces inequalities by 0.05 points, while Australia achieves a reduction of 0.06 points. The strictly positive range of the Kakwani index indicates that all countries have globally progressive tax systems, though individual tax features may still be regressive.

In contrast to case of redistribution through transfers, neither the average tax rate nor the progressivity of the tax system is dominant.¹² For instance, Sweden reaches a slightly stronger reduction than Ireland, in spite of a clearly less progressive tax design, but thanks to a much higher average tax rate. In the full sample, one standard deviation increase in tax progressivity increases redistribution by 0.017 (26 percent of average fiscal redistribution), while one standard deviation increase in the tax rate increases redistribution by 0.019 (29 percent of average fiscal redistribution).¹³ The redistribution conveyed by the tax system is a combination of the two components. The theoretical setting is not different for taxes than for transfers, but because of the range of average tax rates we observe, both variation in the tax rate, and variation in progressivity influences the redistributive outcome.

¹²Fiscal redistribution (the change in the Gini coefficient from gross to disposable income) has a correlation measure of 0.50 with the tax rate, and 0.50 with tax progressivity.

¹³Marginal effects are calculated leaving other parameters centered at their sample mean. The calculation is performed on 67 observations, and robust to various sub-samples (such as excluding year 2010, or using cross-section sub-samples). The average vertical fiscal redistribution is 0.065; one standard deviation of progressivity is 0.04, and one standard deviation of the tax rate is 0.06.

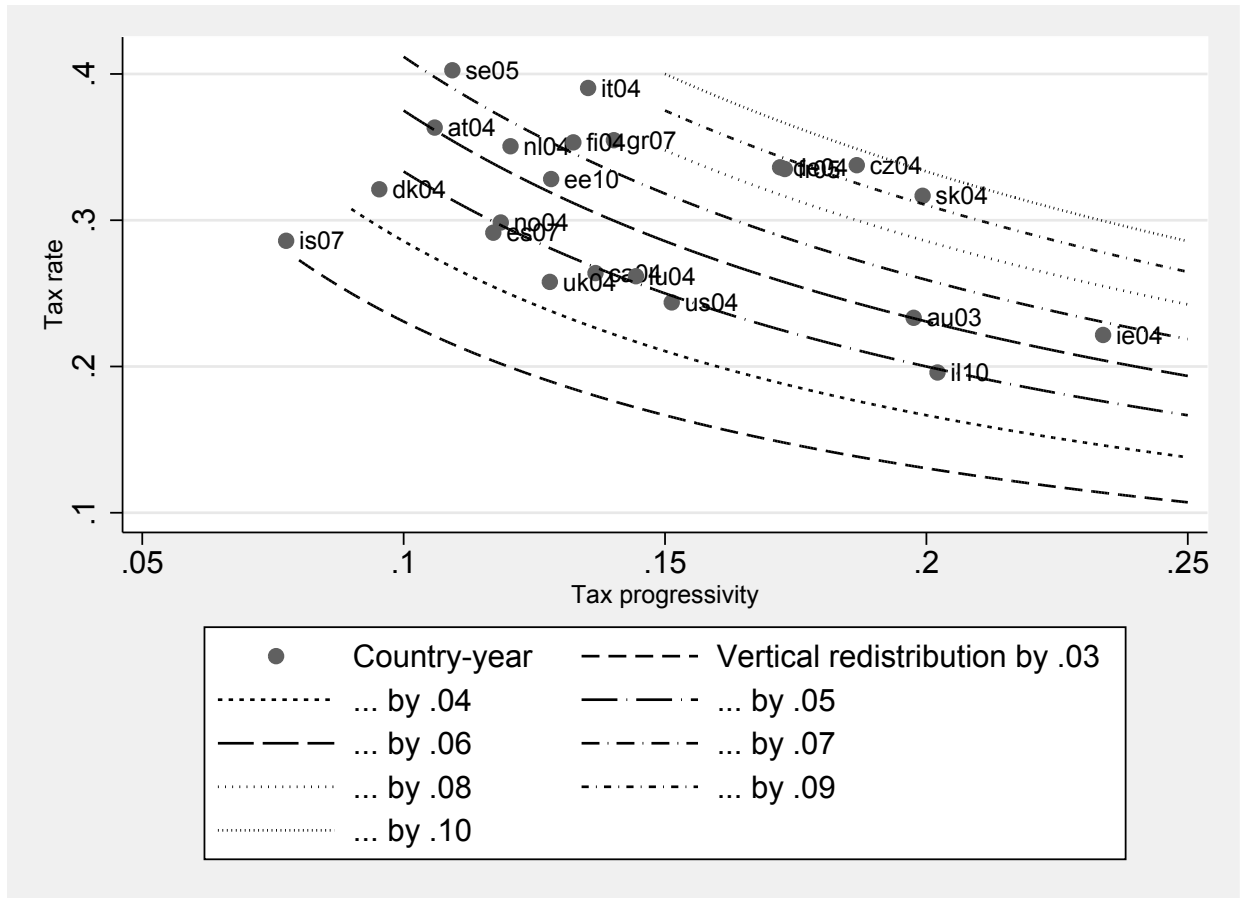


Figure 7: Vertical redistribution by taxes: average tax rate versus progressivity.

Note: The level curves represent the resulting vertical redistribution from some combination of average tax rates, and tax progressivity. Two points on the same level curve represent the same vertical tax redistribution obtained by different combinations of progressivity and rates. This vertical redistribution does not take into account the possible re-ranking effect, and might overstate the effective tax redistribution.

4.4 Typical patterns and incompatible policy choices

Given that tax and transfers systems are the result of political bargaining, it is of interest to highlight typical patterns of tax and transfer systems that show up in the data. We find an incompatibility between a high level of tax progressivity and a high rate of taxation (see Figure 8). This confirms the finding of Verbist and Figari (2014), although with a different methodology and data. Among the 22 observations (one third of the sample, 8 different countries) for which the Kakwani index is higher than 0.17, none has a tax rate higher than 0.34. Symmetrically, among the 15 observations (one fifth of the sample, 8 different countries) for which the tax rate is higher than 0.34, none has a Kakwani index higher than 0.17. However, from a cross-country perspective, we do not observe a strict linear relation. For an intermediate level of the average tax rate, we observe broad variation of tax progressivity. In contrast, there is no clear relationship between targeting, and the average transfer rate (see Figure 9), which confirms the findings by Marx, Salanauskaite, and Verbist (2016) as well as Brady and Bostic (2015).¹⁴

The second stylized fact we observe is a positive link between market income inequalities on the one hand, and the level of tax progressivity, and targeting on the other hand (Figure 10). While the focus is generally on whether targeting and progressivity reduce inequality, it appears that the relationship is stronger in the reverse direction. The countries with high market income inequality tend to use intensely progressive taxation, and intensely targeted transfers.¹⁵ We hypothesize that progressivity and targeting may be a substitute for labour market regulation. Instead of compressing the market income distribution with restrictions on the labour market, such as a minimum wage, inequality is reduced ex-post by taxing the rich, and giving to the poor. However, intense targeting and progressivity do not allow for a particularly unequal country to compensate their original level of inequality (as shown in Figure 4 above).

¹⁴Yet, we find a clear negative relationship between the targeting of transfers, and the level of public pensions. See Appendix A.

¹⁵This is clear for targeting. The correlation between targeting and market income inequality is -0.64, while it is only -0.38 with social redistribution (the inequality reduction due to transfers). For tax progressivity both correlation coefficients are slightly above 0.5.

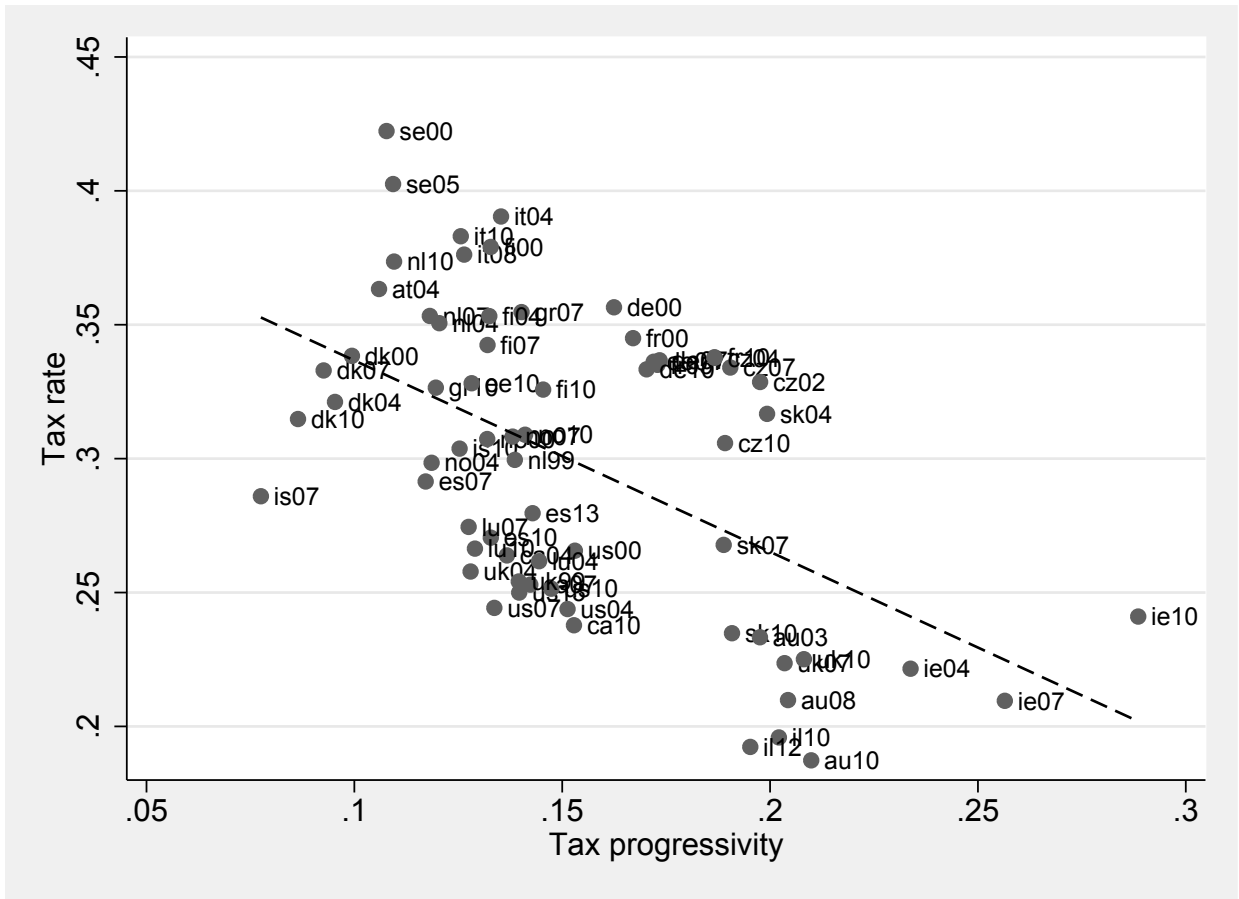


Figure 8: Incompatibility between high tax rate and high progressivity.

Note: Full sample. Tax progressivity index (x-axis) and tax rate (y-axis). There is a decreasing relationship between progressivity and tax rate, driven by the extreme values of the two indicators.

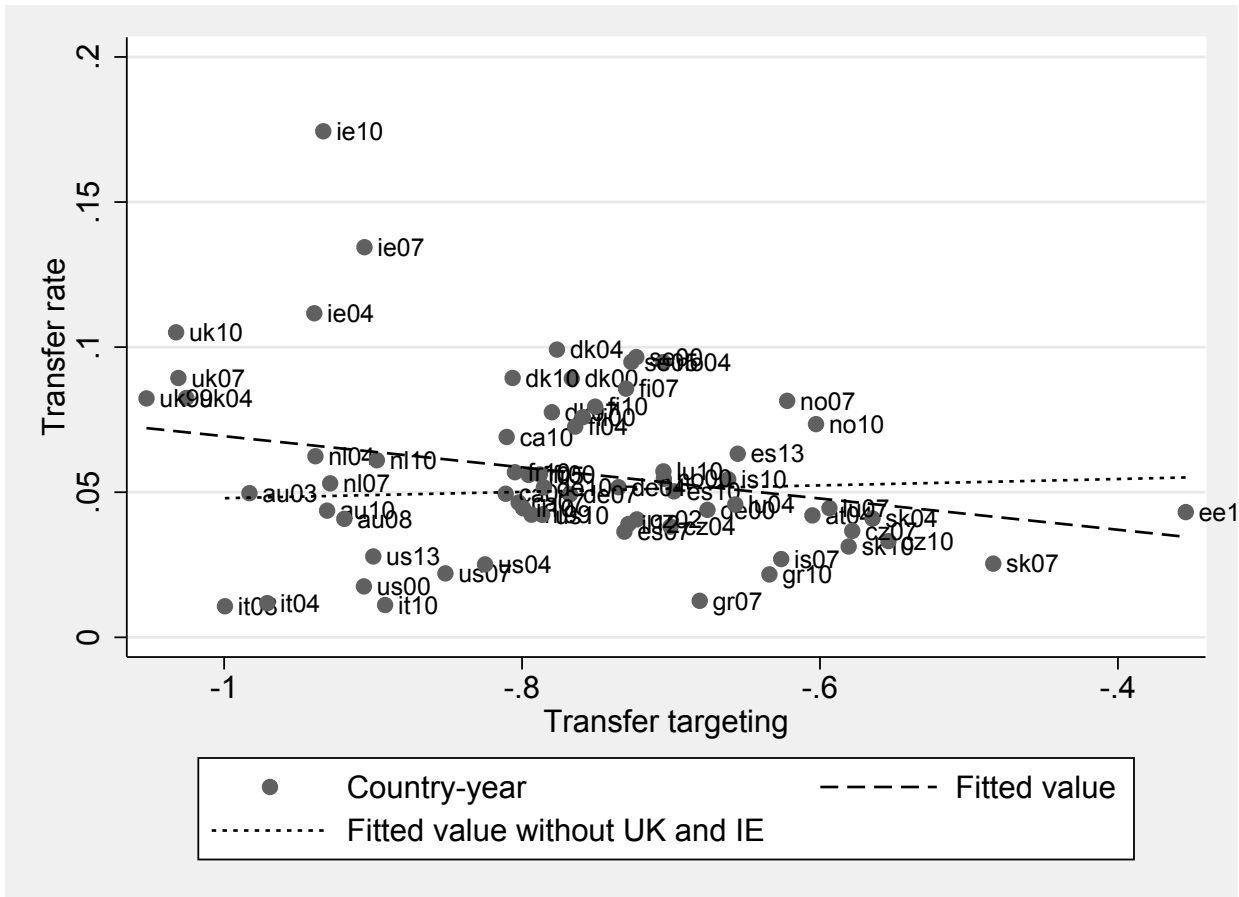


Figure 9: No clear relationship between transfer rate and targeting.

Note: Full sample. Transfer targeting index (x-axis) and transfer rate (y-axis). There is no clear relationship between targeting and transfer rate.

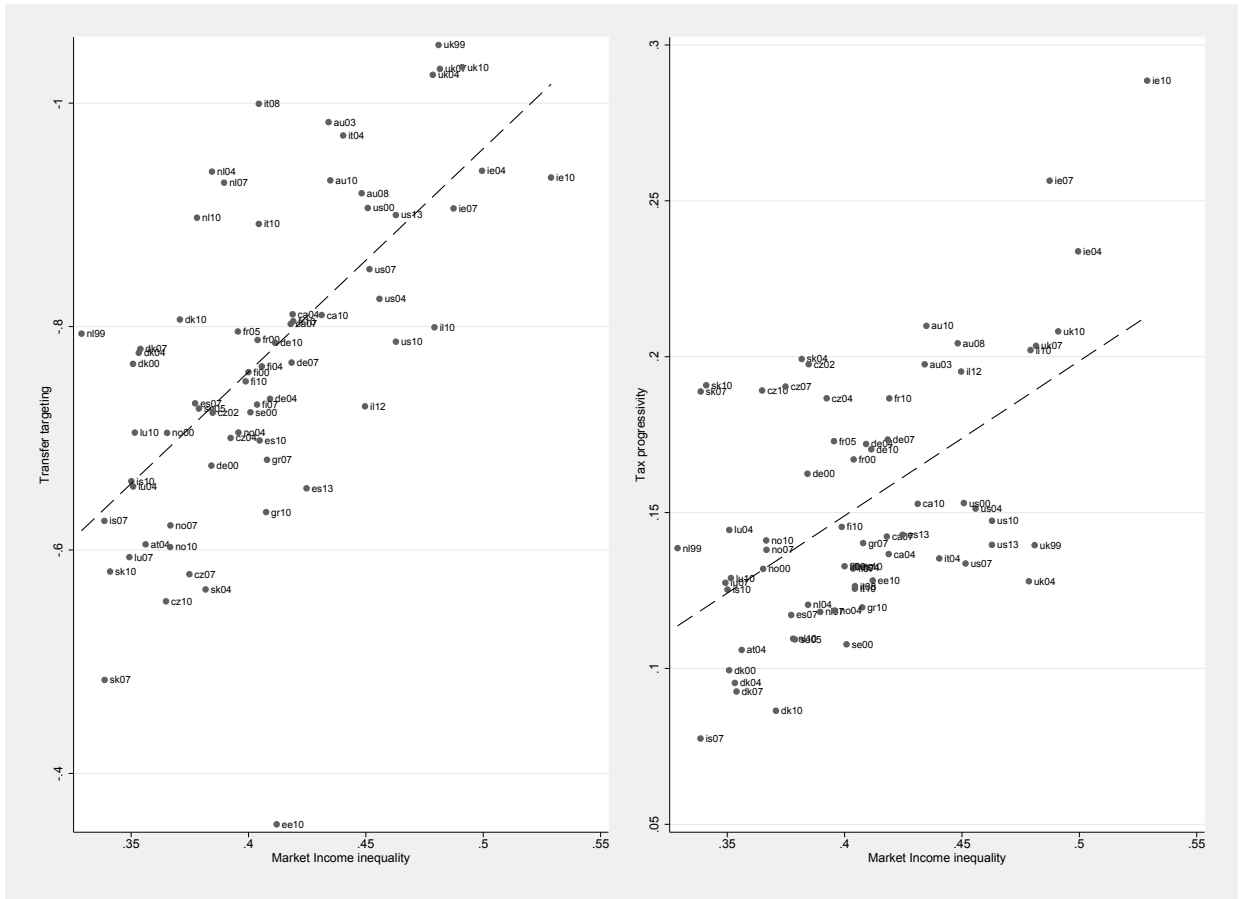


Figure 10: Market inequality and the intensity of tax progressivity, and transfer targeting.

Note: Level of market income (x-axis) inequality and targeting index (y-axis, left graph) or progressivity (y-axis, right graph). There is an increasing relationship between the level of primary inequality and the use of targeting and progressivity.

5 Discussion

We decomposed redistribution into the four levers used in national systems: progressivity, and rate of taxes; targeting, and rate of transfers. This approach raised three main findings. First, when excluding pensions, tax redistribution dominates transfer redistribution in most countries. Second, cross-country heterogeneity in the intensity of targeting explains very little of the observed variation in inequality reduction. In contrast, both progressivity of taxes and the average tax rate have large impacts on redistribution. Third, we observe the trace of political trade-offs. High average tax rates do not appear in conjunction with highly progressive tax systems.

Our findings resulted from a novel approach. We studied the impact of taxes and transfers simultaneously, rather than in isolation. We strongly recommend that future comparative studies should also take a global approach. The balance between tax and transfer redistribution varies significantly across countries. The usual framework that considers only one side of monetary redistribution, be it through taxes or through transfers, leads to a highly biased perspective for international comparisons.

We also highlighted the bias that arises from restricting the analysis of taxation to the taxes that are paid by households (and appear in household surveys). The tax incidence often falls on households despite being paid by firms. In the context of inequality reduction, income tax, employer and employee contributions are economically equivalent. Our study is a step forward since it provides far more comparable data on the tax side – thanks to the imputation of employer contributions. Further improvements could be attained by including consumption tax, and in kind benefits, or by making use of administrative data Meyer and Mittag (2015). We acknowledge that these improvements could alter our findings, as consumption tax is suspected to have anti-redistributive effects, while in kind benefits are likely to have strong egalitarian effects.

Lastly, we call for more careful consideration of the paradox of redistribution. Analyses that focus on one or two specific levers of redistribution among the four we identified could not only lead to flawed results, but also deliver misleading policy recommendations. As shown in the formula proposed at the beginning of the paper, the relative importance of each lever depends on its combination with other levers. For example, the marginal contribution of progressivity on redistribution strongly depends on the average rate of taxation. As already emphasized by scholars studying the paradox of redistribution, redistributive policies are the outcome of a political balance of these four levers. In our study, we empirically observe an incompatibility between strong progressivity, and high level of taxation. This result indicates that governments cannot change redistributive policies in isolation. Pulling down one lever may move another.

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A The distributional impact of public pensions

We include pensions in market income so the contribution of pensions to reducing inequality is not measured by our initial analysis. Therefore, we conducted a specific analysis to measure the distributional impact of public pensions.

We compute the share of public pensions in the factor income of households for each income level. As we did for social transfers in the main analysis, we also compute the targeting of public pensions over the total population (ranked over their market income).

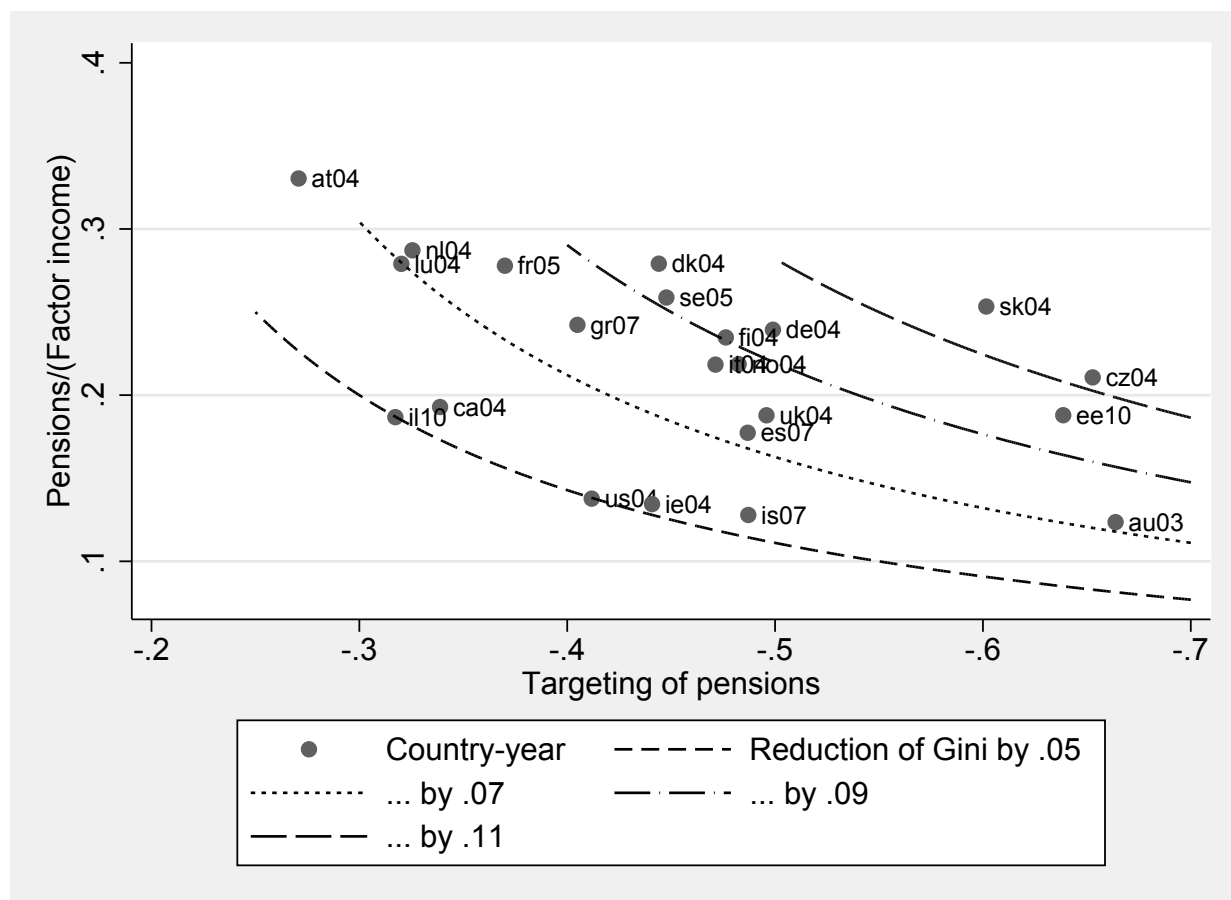


Figure 11: Inequality reduction of Pension: average level and targeting.

Note: The rate of pensions (depending on factor income) is measured on the vertical axis, and the index of targeting (inverted scale) is measured on the horizontal axis. The closer the index is to a value of 0, the less the pensions are targeted at poor households. The lines represent the degree of equalization of the market income attributable to these parameters. Two points on the same level line represent the same equalization of income obtained by different combinations of targeting and pension rates.

France has a high level of pensions, while its pension system is targeted with little intensity (Figure 11). In general, one can see a negative correlation between generosity of pensions, and targeting of pensions, as suggested by Korpi and Palme (1998). For most countries, the effect of pension on inequality appears stronger than the one of the tax-system, or of the transfer system.

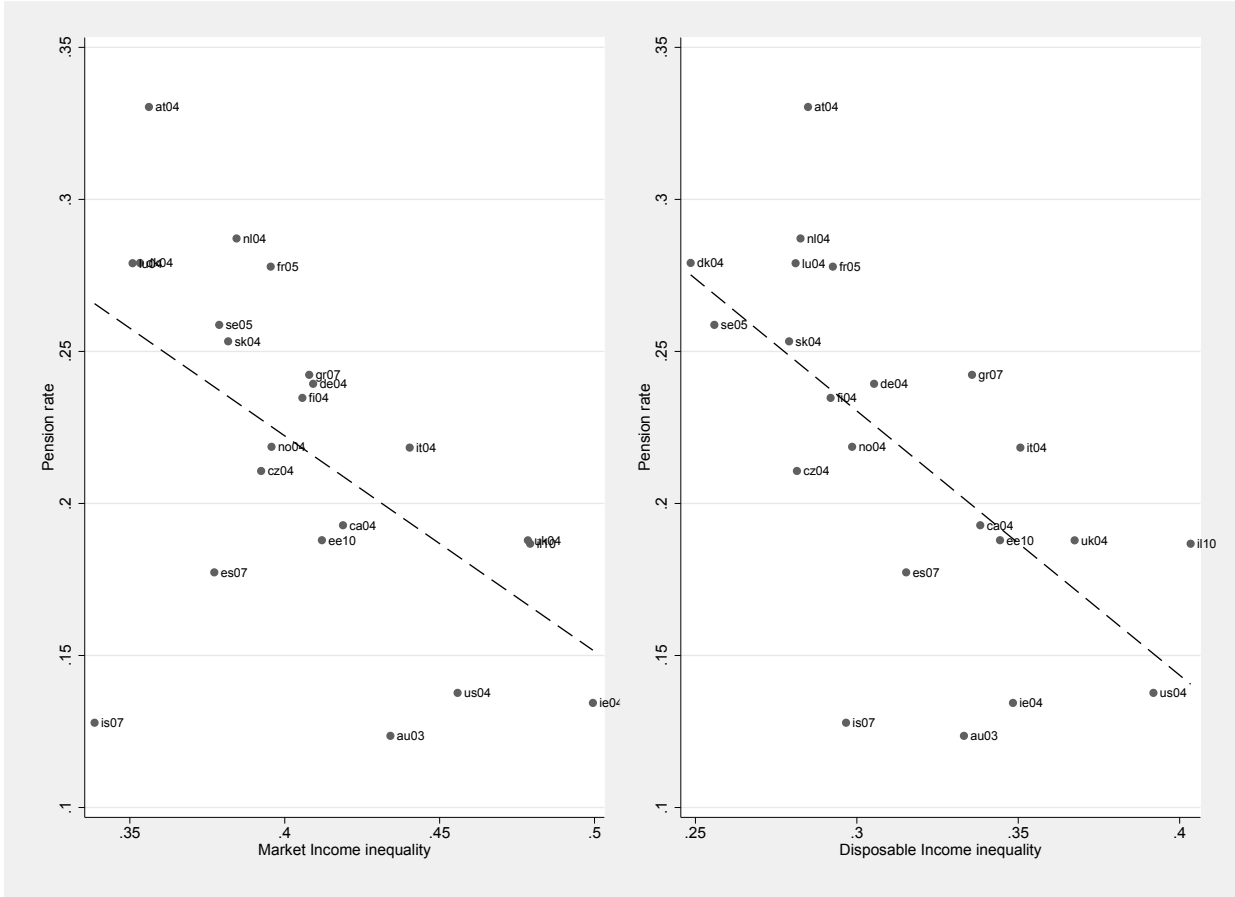


Figure 12: Pension level and inequalities measured at the market income and disposable income stage

Note: As the average pension rate increases (as a share of pensions to factor income) shown on the vertical axis, inequalities in disposable income (right panel), or in market income (left panel) tend to decrease. The deviations to the regression line is mainly due to the effects of a more or less pronounced targeting of pensions in different countries in relation to capital and labour income.

Countries where market income inequality is low (Nordic and Bismarckian countries) are also countries where the redistribution conveyed by pensions is high. This suggests that countries where public pensions are less generous and redistributive do not achieve the same level of inequality by other means such as through savings, or private schemes.

As shown in Figure 12 the pension rate is a strongly correlated with the level of market income, and disposable income inequality.

B Consequences of imputed tax on the LIS dataset

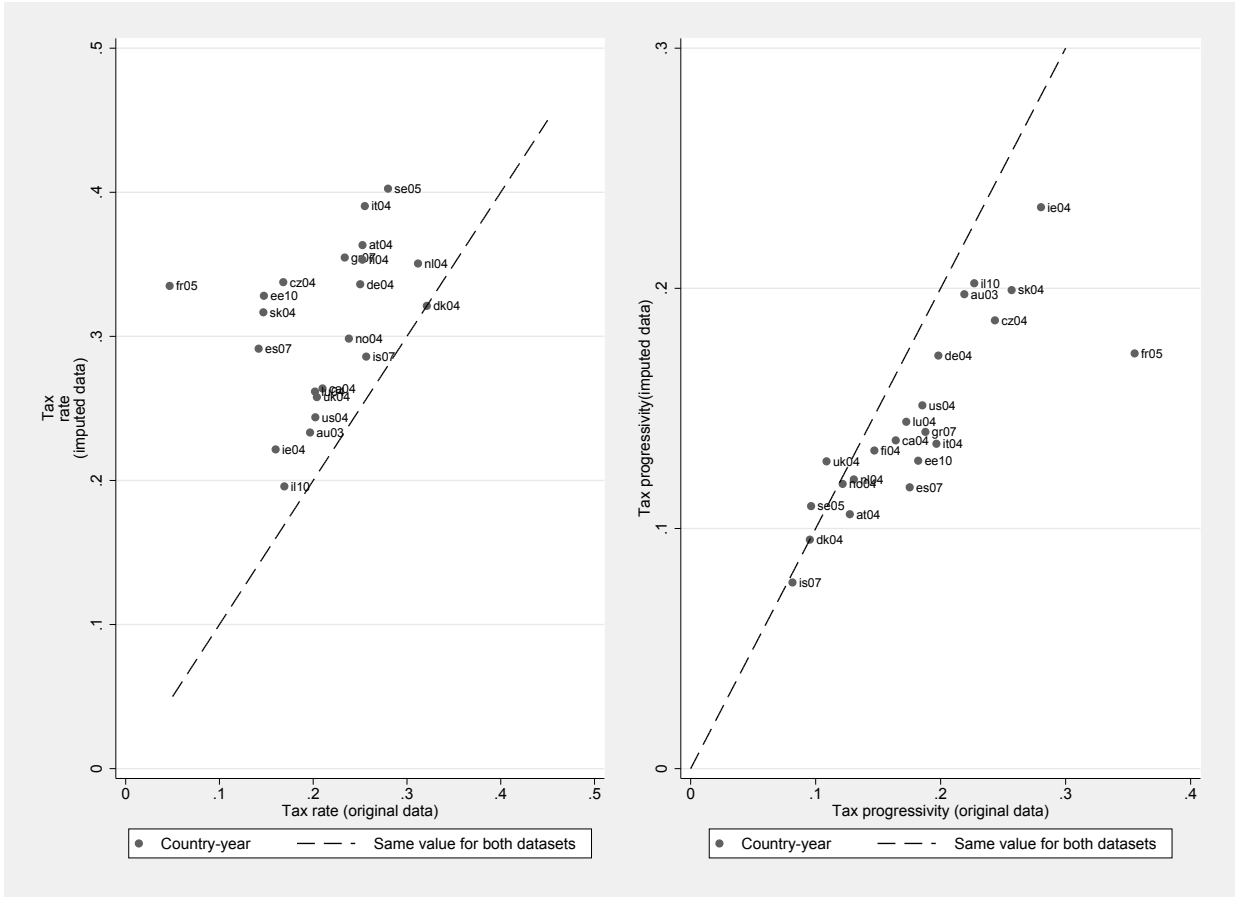


Figure 13: Tax rate and tax progressivity with original LIS data, and with imputed tax data

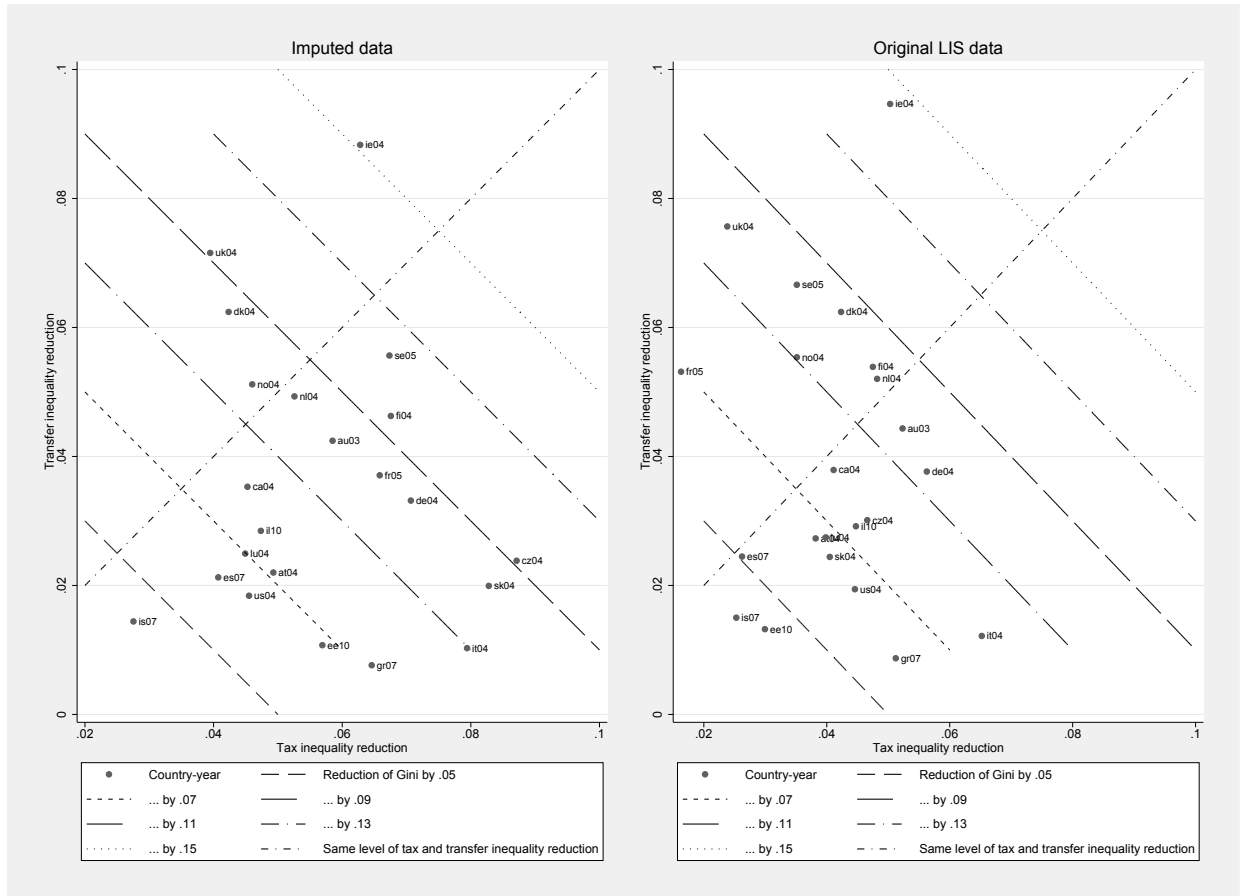


Figure 14: Tax and transfer contribution to inequality reduction with original LIS data, and with imputed tax data.

Note: The graph on the left reproduces Figure 5 of our study, and the graph on the right reproduces the graph with the original LIS data. The differences between the graphs show that imputing employer social security contributions changes the redistribution due to taxes, and therefore the overall monetary redistribution, for a number of countries.

C Regression analysis

The regression line in Figure 15 shows the redistribution level obtained as a function of the transfer rate, for a targeting value fixed at its sample mean (Kakwani index of -0.77). As the transfer rate increases, the effective social redistribution increases almost linearly (correlation of .90); it is therefore very little dependent on the targeting of transfer. Any deviation from the regression line can be interpreted as the additional (or lower) redistribution obtained through a higher (or lower) targeting of transfers, as compared to the average targeting. The observation of extreme values (UK-2004 which has a market targeting of -1.05, or Estonia-2010 with an extremely low targeting of -0.35) reveals that social redistribution is in fact marginally affected by a change in targeting. Hence, marginal effects are a good approximation of the effective impact of targeting and transfer.

The regression line in Figure 16 shows the redistribution level obtained as a function of the tax rate, for a progressivity value fixed at its sample mean (Kakwani index of 0.15). In contrast to the case of transfers, the increase in the effective tax redistribution is not linearly related to the tax rate. For a tax rate of about 33 percent, the actual redistribution with a progressivity of 0.15 would be 0.06 Gini point, but Denmark-2004 reaches 0.04 only, because of its low tax progressivity. With a comparable tax rate, Slovakia-2004 reduces its Gini by 0.08 because of the strong progressivity of its tax system.

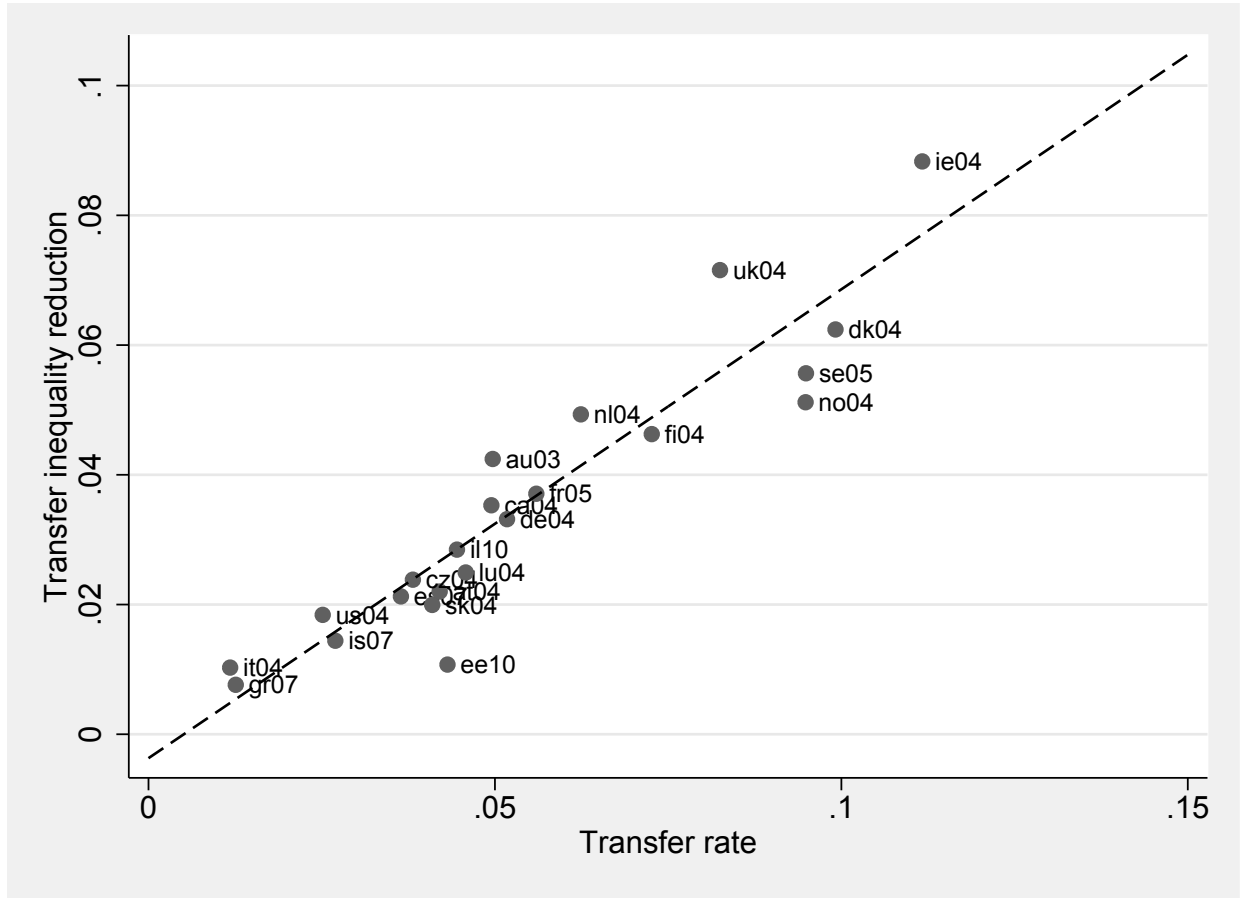


Figure 15: Effective social redistribution and transfer rate.

Note: As the transfer rate increases (x-axis), effective social redistribution (y-axis) increases almost linearly (correlation of .90); it is therefore very little dependent on the targeting of transfer. Deviations to the regression line are explained by the effects of higher (or lower) targeting of transfers, as compared to the average targeting of -0.77 –and to a lower extent by re-ranking effects.

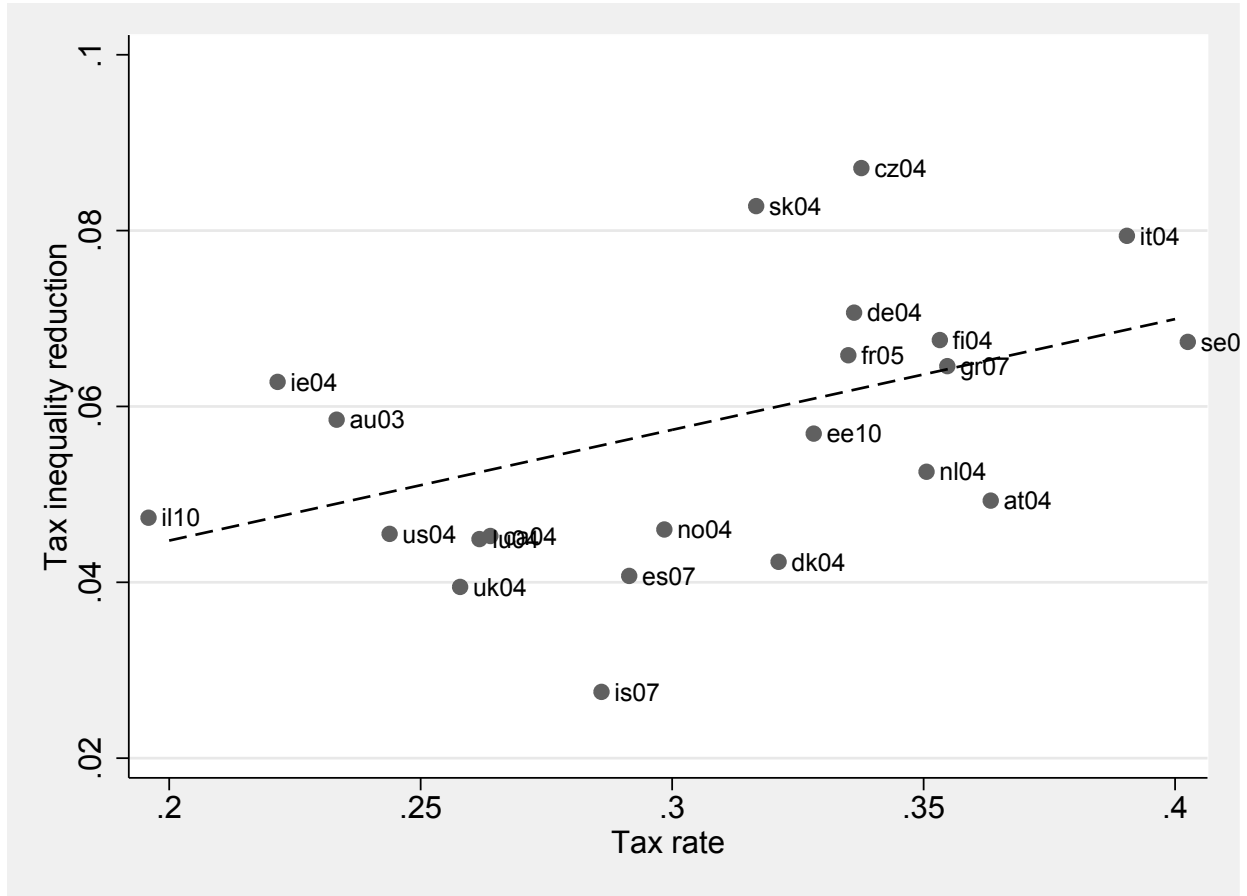


Figure 16: Effective fiscal redistribution and tax rate.

Note: As the tax rate increases (x-axis), effective fiscal redistribution (y-axis) increases, assuming average progressivity (sample mean 0.15). In contrast to the case of transfers, the increase in the effective fiscal redistribution is not linearly related to the tax rate. The deviations to the regression line are due to the effects of more or less pronounced progressivity and, marginally, to re-ranking effects.

D Tables

Table 1: Income Definitions

Stage	Concept	Definition	Transition	LIS variables
Stage 1	Primary income	gross labour income + capital income + employer social security contributions (employer ssc)		hil + (hic-hicvip) + hsscer
Stage 2	Market income	gross labour income + capital income + employer ssc + pensions	Primary income + pensions	hil + (hic-hicvip) + hsscer + (pension - hitsap)
Stage 3	Gross income	gross labour income + capital income + employer ssc + pensions + social transfers (other than pensions)	Market income + cash social transfers (other than pensions)	hil + (hic-hicvip) + hsscer + (pension - hitsap) + (hits - hitsil - hitsup)
Stage 4	Disposable income	gross labour income + capital income + pensions + social transfers (other than pensions) - employee ssc - income taxation	Gross income - income taxation and social security contribution (employer and employee)	hil + (hic-hicvip) + (pension - hitsap) + (hits - hitsil - hitsup) - hxits - hxiti
Stage 5	Disposable income net of consumption taxes	gross labour income + capital income + pensions + social transfers (other than pensions) - employee ssc - income taxation - tax on consumption	Disposable income - tax on consumption (VAT)	hil + (hic-hicvip) + (pension - hitsap) + (hits - hitsil - hitsup) - hxits - hxiti - hxct

Notes: Units of observation are households. Income are corrected for household size using the square root scale. Employer social security contributions (ssc), and tax on consumption are systematically imputed; and employee ssc and personal income tax are imputed when data is unavailable. Pensions include public pensions (work-related and universal) and private pensions, but exclude assistance pensions. UK and IE are exceptions: because of uncertainty in the coding of the data, we included assistance pension (hitsap) in pensions. Social transfers comprise all cash transfers, excluding public, and private pensions (as defined above) but including assistance pensions.