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Abstract

Cross-country income inequality has declined in the last decades, but this trend has been paralleled by an increase in within-countries inequality. At the same time, many governments have implemented fiscal decentralization policies, devolving increasing decision-making powers on fiscal matters to sub-national levels of government. In this paper, we provide empirical evidence on the relationship between fiscal decentralization and intra-regional income redistribution, based on regional level data on inequality and government revenues for 187 regions of 15 OECD countries. Our results show that within region income redistribution is negatively associated with fiscal decentralization, especially when it takes the form of revenue decentralization.

JEL classifications: H2, H7, R5
Keywords: Fiscal Decentralization; Inequality; OECD Regions

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1 Introduction

While cross-country income inequality has declined in the last decades, there is ample evidence of a parallel increase in within-countries inequality (Arestis et al., 2011; Goodhart, 2017; Liberati, 2015). At the same time, many governments have implemented fiscal decentralization policies, devolving increasing decision-making powers on expenditures and revenues to sub-national governments (Filippetti and Sacchi, 2016; Garman et al., 2001; Hooghe et al., 2010). Since the increase in within-countries income inequality has been identified by many as a key driver of populist backslash taking place around the world (Inglehart and Norris, 2016; Kriesi, 1999; Piketty et al., 2018), it is important to understand if there is any link between the two phenomena.

From a theoretical perspective, the literature on the effects of fiscal decentralization on inequality has provided mixed answers. While a first generation of contributions (Musgrave, 1959; Oates et al., 1972; Stigler, 1998) has argued that devolution to sub-central levels of government of tax and expenditure authorities reduces intra-regional income inequality and increases inter-regional inequality, a more recent strand of literature has emphasized that decentralization favors smaller government size – from both the expenditure and the revenue side – and higher interpersonal inequality, which eventually results in higher within region income inequality (Roine et al., 2009).

Given the opposed predictions of theoretical models, the answer on the impact of decentralization on income distribution needs to be assessed empirically. To this purpose, we conduct an analysis of the relationship between fiscal decentralization and intra-regional income redistribution, based on regional level data on inequality and government revenues and expenditures for 187 regions of 15 OECD countries.[1]

Our work builds on Tselios et al. (2012), but it has two relevant differences. First, while they analyze the "direct" impact of fiscal decentralization on income inequality, we focus instead on income redistribution. That is, we are interested in assessing if the degree of fiscal decentralization plays a role in the policy objective of reducing intra-regional differences in before-tax income distribution (i.e., differences within each region). To this purpose, the dependent variable in our baseline empirical model is the difference between the Gini index calculated on before-tax and cash transfers income, and the Gini index calculated on income after taxation and benefits. Second, different from Tselios et al. (2012), we focus on two different measures of fiscal decentralization. One is a comprehensive measure of fiscal authority at the regional level, developed by Marks et al. (2008) and used in several studies on the effect of decentralization on macroeconomic variables such as economic growth (Filippetti and Sacchi, 2016) and fiscal stability (Lago-Peñas et al., 2020). The other is a quantitative measure of fiscal decentralization, based on the share of local revenues over total government revenues.

Our results show that income redistribution within regions is negatively associated with both the institutional measure of fiscal autonomy and the quantitative measure of revenue decentralization. This finding is confirmed also controlling for spending decentralization, that instead appears to have a positive association with income redistribution.

[1] OECD regions are worthy of attention as they have been shown a high heterogeneity in standard living, decentralization, and income inequality (Döpke et al., 2017; Peiró-Palomino, 2019).

The rest of the paper is organized as follows. Section 2 sets the framework of our analysis, reviewing the literature that helps contextualizing our contribution, and discussing our research questions. Section 3 presents the data and some preliminary evidence based on summary statistics. Section 4 presents the empirical model and the results. Section 5 concludes.

2 The frame of our analysis

From a theoretical perspective, the literature on the effects of fiscal decentralization on inequality can be broadly classified into the two main strands of first- and second-generation theories of fiscal federalism (Oates, 2005; Weingast, 2014). According to the first-generation theories (Musgrave, 1959; Oates et al., 1972; Stigler, 1998), devolution to sub-central levels of government of tax and expenditure authorities reduces intra-regional income inequality, increasing inter-region inequality. From an intra-regional perspective, if the central government acts as a benevolent agent who faces heterogeneous preferences and has the objective of increasing residents' welfare, a decentralized structure can exploit its information advantages and its flexibility to provide public goods and services which are better targeted to citizens' needs and preferences. However, from an inter-regional perspective, sub-national governments are less efficient than central governments in implementing redistribution policies because their preferences may give raise to regional polarization. If low-income taxpayers prefer to move to jurisdictions with generous local redistribution policies (e.g., universal provision of public services financed with progressive taxation) and high-income taxpayers prefer instead to move away from such jurisdictions, absent national redistribution policies, an equilibrium with low intra-regional income inequality and high inter-regional income inequality is likely to emerge. In other words, individuals can "vote with their feet" and sort themselves into homogeneous communities where their preferences are maximized and their differentiation is minimized (Tiebout, 1956). However, this view has been challenged for at least two reasons. First, with imperfect inter-regional mobility and majority voting, decentralization of redistribution policies may lead to Pareto improvements (Pauly, 1973). Second, if fiscal decentralization leads to a sufficiently high per-capita income to overcome the inverse U turn described by Kuznets (1955), this may favor a reduction in income inequality via a "Kuznetz effect"(Ezcurra and Rodríguez-Pose, 2013a).

Second-generation theories of fiscal federalism take instead a public choice perspective, by assuming the presence of selfish public officials who maximize their private utility. Of course, this is a very different approach with respect to the assumption that the government acts as a benevolent policy-maker (Martínez-Vázquez et al., 2017). According to this strand of literature, decentralization allows to better control for an excessive expansion of the public sector (Weingast, 1995, 2009), limiting government size and fostering competition among more efficient private sector activities (Tanzi, 2002; Wilson, 1986; Zodrow and Mieszkowski, 1986). Clearly, this implies that smaller governments – from both the expenditure and the revenue side – are associated with higher inequality (Roine et al., 2009).

From this perspective, a number of papers have studied the relationship between fiscal decentralization and country-level inequality, focusing on different countries and time periods and using different measures of fiscal decentralization. Remarkably, most contributions focus on the same dependent variable, that is the country-level Gini index on income, either before or after

taxation. Studying a sample of 37 developed and developing countries across three decades (1970 – 1990), Neyapti (2006) finds a negative relationship between revenue decentralization – interacted with measures of the quality of public sector governance – and income inequality. She interprets the results as evidence of "inefficient and/or unequitable revenue collection decisions due to under-utilization of the revenue potential of [locally] politically powerful groups" (p. 410). Sepulveda and Martinez-Vazquez (2011) study instead the relationship between public expenditure decentralization, government size, and country-level income distribution, focusing on 56 developed and developing countries between 1971 and 2000. They find that public expenditure decentralization worsens income distribution when general governments are small, but it improves it when the general government reaches a sufficiently large size. They interpret this result as showing that when general government size is small, a higher degree of expenditure decentralization withdraws resources that would otherwise be used for redistribution policies, while the opposite is true for sufficiently large government size. Sacchi and Salotti (2014), studying a wider range of decentralization measures for a sample of 23 OECD countries, provides only partial support to the results of Sepulveda and Martinez-Vazquez (2011), showing that tax decentralization has a negative effect on the country-level income inequality, while public expenditure decentralization has no significant impact. Analyses of the relationship between public sector decentralization and intra-regional income inequality are less common, possibly because of more limited data availability.[2] Two notable exceptions are the papers by Morelli et al. (2007) and by Tselios et al. (2012). The former studies the impact of devolution using household level data for Scotland and Wales, concluding that the effect on income inequality is insignificant, while it is weak and temporary on social inclusion. On the contrary, Tselios et al. (2012) – whose paper is the closest to our analysis – study the relationship between fiscal and political decentralization, regional economic development, and intra-regional income inequality on a sample of 13 European countries between 1995 and 2000. Different from other studies mentioned above, they use the Theil index as the main measure of income inequality, although they show that their results are confirmed using the Gini index. They measure fiscal decentralization on both the expenditure side, through the share of local public expenditures over general government expenditure, and on the revenues side, through the share of local tax revenues over general tax revenues. Their main result is that decentralization reduces intra-regional income inequality, the more so the lower the level of per-capita income in the region.

Building on the available evidence, our analysis takes three original steps. First, we study how fiscal decentralization affects the change between intra-regional gross income inequality and intra-regional after tax and cash-transfers income inequality. In other words, we do not focus on the level of within-region income inequality, but on within-region income redistribution.[3] We focus on redistribution because it is the part of income distribution that can be directly imputed to the government activity (Persson and Tabellini, 1996). In addition, we control for the level of within-region market income inequality as measured by the before tax Gini index, so that we take into account the possible effect of market inequality on the regional governments' propensity to enact redistribution policies. Second, we adopt two complementary

[2]It should be mentioned that some studies have instead investigated the relationship between inter-regional inequality and decentralization (Ezcurra and Rodríguez-Pose, 2013b; Kyriacou et al., 2017)), as well as the link between decentralization and regional convergence (Van Rompuy, 2021).

[3]It is worth emphasizing that the share of taxation determined at the local level – the average in our sample is 27 per cent – has no direct relationship with the degree of income redistribution, which depends instead on how local taxation is distributed across the population.

approaches to measure fiscal decentralization: (i) a measure of fiscal autonomy proposed within the wide range of regional authority indices (RAI) developed in the field of political science (see, in particular Hooghe et al., 2016); and (ii) a quantitative measure of decentralization, that is the share of revenues decided at the regional level.[4] Third, we adopt a two stage approach to identify the impact that fiscal decentralization has on income redistribution by allowing for a larger share of revenues to be decided at the regional level. To this purpose, we follow the intuition of Kashyap et al. (2002) and run a two stage regression of income redistribution on the value of regional revenues that is predicted, in the first stage, by fiscal autonomy. While we are unwilling to consider our approach as a rigorous instrumental variables strategy, we note that the value of share of revenues to be decided at the regional level that is predicted by a first stage regression on the index of fiscal autonomy is the orthogonal projection of the former on the latter. As such, it measures the amount of decentralization of revenues that is due to the fact that the institutional setting allows for stronger fiscal autonomy. Based on the results of this two-steps procedure, we can assess to which extent the institutional setting affects income redistribution through revenue decentralization.

3 Data and Summary Statistics

To analyze the relationship between public sector decentralization and within region income distribution we use data from three main sources. From the OECD Regional income distribution dataset we use information on the Gini indices of income, before and after taxes and cash transfers at regional level (i.e., within each region). Regions are defined as the first administrative tier of sub-national government, so called Territorial Level 2 or TL2 in the OECD classification. Data are fully comparable across countries and regions.[5] In our analysis, we include information on 187 regions of 15 countries, referring in most cases to 2013 (the few exceptions are due to data availability).[6] The number of regions in each country reflects the size of the country and its administrative organization, ranging from 3 in Belgium to 51 in the United States.

Data on government revenues (and expenditures), both at general and sub-national level, are also provided by the OECD, in the Government at a Glance dataset, and are derived mainly from the OECD National Accounts, harmonized according to the new standards of the System of National Accounts (SNA) 2008, complemented by data from Eurostat, IMF and national statistical institutes.[7] Due to data limitations, and following the prevalent approach in the literature (see, e.g., Sacchi and Salotti (2014)), revenues (and expenditures) at the level of any sub-national entity (i.e., state, region, province, county, municipality) are aggregated into a single group, and defined as "local" revenues and expenditures.

Following Neyapti (2006) and Tselios et al. (2012), we measure fiscal decentralization with the

[4] We further control for a quantitative measure of fiscal autonomy that is the share of decentralized public expenditures.

[5] Data are available at https://stats.oecd.org/index.aspx?queryid=58616

[6] The following countries and years are included in the sample: Austria (AUT, 2013), Belgium (BEL, 2013), Canada (CAN, 2013), Czech Republic (CZE, 2013), Denmark (DNK, 2013), Germany (DEU, 2013), Italy (ITA, 2013), Japan (JPN, 2009), Norway (NOR, 2014), Slovak Republic (SVK, 2013), Spain (ESP, 2013), Sweden (SWE, 2014), Switzerland (CHE, 2010), United Kingdom (GBR, 2011), United States (USA, 2014).

[7] Data are available at https://stats.oecd.org/Index.aspx?DataSetCode=SNGF

incidence of sub-national public revenues, defined as the value of total sub-national government revenues, net of grants from other levels of government, as a share of consolidated general government revenues, net of intergovernmental grants. In some specifications, we also control for decentralization on the expenditure side. Following Sepulveda and Martinez-Vazquez (2011) and Tselios et al. (2012), we use the incidence of local government spending, defined as the sub-national government expenditures as a share of general government expenditures.

Finally, we employ a component of the Regional Authority Index (RAI) developed by Marks et al. (2008)[8] and used in several studies on the effect of decentralization on different variables (Filippetti and Sacchi, 2016; Lago-Peñas et al., 2020). The RAI is a composite indicator that encompasses two dimensions of regional government autonomy and influence ability: *self-rule*, and *shared-rule*. Each one of the two dimensions is measured with reference to several institutional aspects. We choose to focus on *self-rule*, which refers specifically to the ability of the regional government to exercise authority over those who live in its territory, and refers to five aspects of public intervention: institutional depth, policy scope, fiscal autonomy, and representation.[9] Although several of these aspects may potentially affect income re-distribution, we decide to focus on the one that is more likely to have a direct impact, that is fiscal autonomy. This index measures the extent to which a regional government can independently tax its population, and can take values from 0 to 4. The highest value is assigned to those regional governments that are allowed to set the base and the rate of at least one major tax: personal income, corporate income, value added, or sales tax, while the lowest corresponds to the case in which tax rates and tax bases of regional taxes are independently set by the central government.

Additional characteristics at the country and regional levels included in the empirical analysis (e.g., per capita GDP, dependency ratio) are also provided by the OECD.

Table 1 presents the summary statistics of the main variables used in the empirical analysis. The average value of the intra-regional Gini index before tax and cash transfers is 0.479, ranging from 0.370 in Eastern Switzerland to 0.594 in the Brussels Capital Region. Its coefficient of variation is 0.093. Gini after tax and cash transfers is on average 0.313, 0.166 points lower the intra-regional Gini before tax and cash transfers, and ranges from 0.227 in Northern Norway to 0.459 in Washington's District of Columbia, with a coefficient of variation of 0.162. The difference between the intra-regional Gini before tax and after tax, our main variable of interest, is on average 0.166, with a coefficient of variation of 0.273, and ranges from 0.080 in Canada's Alberta to 0.273 in the German region of Saxony-Anhalt. Interestingly, GDP per-capita calculated at the regional level has a coefficient of variation of 0.377, that is higher than that calculated at the national level (that in our sample is 0.222).

Fiscal autonomy has an average value of 3.502 in the range 0.076-5.139. Table 2 presents data at the country level, showing that fiscal autonomy displays the lowest value in Denmark (0.076) and the highest value (5.139) in the United States. Local spending ranges from 0.155 in the Slovak Republic to 0.639 in Switzerland. Not surprisingly, aggregate government spending and taxation over GDP also show high variability across countries.

Tables 3 and 4 present the country-level averages of the value of the before-tax and after-tax Gini indices calculated at the regional level. Interestingly, within country variation is not

[8] See Hooghe et al. (2010) for an extensive and in depth analysis of the RAI's framework.
[9] For details about the definition of each single aspect see Marks et al. (2008).

negligible, confirming the importance of studying the impact of public sector decentralization watching not only at the dispersion in average income across regions of a given country (i.e., calculating the Gini coefficients based on region averages), but also within regions. The within-country coefficient of variations of the before-tax Gini indices range from 0.018 in the Slovak Republic (0.015 for the after-tax index) to 0.132 in Belgium (0.208).

The difference between the Gini before tax and that after tax, reported in Table 5, ranges from 0.118 in the United States to 0.233 in Belgium.

Table 6 presents the values of pairwise correlations among the main variables used in the empirical analysis. The Gini index before tax and the Gini index after tax are positively correlated with fiscal autonomy. The reduction in Gini after tax and cash transfers is negatively correlated with the level before taxation, with the index of fiscal autonomy and with the incidence of sub-national public revenues. Interestingly, it is also negatively correlated the incidence of local government spending, which nonetheless is strongly positively correlated with local taxation.

Figure 1 presents a scatter-plot of the average change of the Gini index before and after taxation and the index of regional fiscal autonomy described above. The negative slope of the regression line, that is statistically significant at the 5 per cent level, confirms the preliminary evidence of the pairwise correlations. However, while these results provide an interesting picture of the relationship between fiscal decentralization and the change in the inequality of income distribution before and after taxation, the evidence is based on country-level aggregated measures and does not consider the regional heterogeneity in income, general taxation, general public spending, and demographic aspects. To better understand these links, in the following section we will conduct a more refined econometric analysis.

4 Results

We estimate the impact of fiscal decentralization on within-region income redistribution adopting the following specification:

$$\Delta Gini_{rt} = \alpha + \beta_1 Gini\_before_{rt} + \beta_2 decentralization_{ct} + \beta_3 Z_{ct} + \beta_4 X_{rt} + \epsilon_{rct} \qquad (1)$$

where $\Delta Gini_{rt}$ is our measure of income redistribution: the region-level difference between Gini before and after taxes and cash transfers;[10] $Gini\_before_{rt}$ controls for regional-level inequality before taxes and cash transfers; $decentralization_{ct}$ is the index of fiscal autonomy, taken from the RAI (Hooghe et al., 2016), or the share of revenues decided at the regional level. X_{rt} is a set of control variables at the regional-level (i.e., GDP per-capita and elderly dependency); and Z_{ct} is a set of control variables at the country-level (i.e., aggregate government spending over GDP, and total taxation, also over GDP). In most specifications, we also control whether the estimated effect of fiscal autonomy is robust to controlling for the impact of local government spending.

[10] $\Delta Gini_{rt}$ is higher than zero almost by construction, as any government causes a reduction in market inequality by means of taxation and cash transfers (see Table 5); a higher level of $\Delta Gini_{rt}$ indicates therefore higher redistribution.

We estimate three sets of regressions, based on three different proxies of $decentralization_{ct}$: the first set includes the fiscal autonomy index; the second set uses the share of revenues decided at the regional level; the last set of regressions is a two-stages specification, where the first stage equation regresses the share of regional revenues on fiscal autonomy, and the second stage equation uses the fitted values of the shares of regional revenues obtained in the first stage as an explanatory variable in the original regression equation (1). As argued above, adapting the intuition of Kashyap et al. (2002), this allows to measure the amount of decentralization of revenues that is due to the fact that the institutional setting allows for stronger fiscal autonomy. All estimates are conducted on the same sample of 187 observations from 15 countries. To control for the likely within-country correlation of the error term, we cluster standard errors at the country-level. The R-square in our richer specifications is above 80 per cent, confirming that large part of the regional redistribution is explained by our explanatory variables.

As for the first set of regressions, Table 7 shows that fiscal autonomy has a negative and significant impact on income redistribution. Negative and significant coefficients are estimated by each specification of the model: the parsimonious version which only controls for inequality before tax and transfers (column 1), and those which include an increasing set of additional covariates (columns 2, 3, and 4). In line with the preliminary evidences in Figure 1, Table 7 reveals that income redistribution in each region is negatively and robustly associated with the extent to which a regional government can independently tax its population. Regarding the remaining covariates, Table 7 shows that the impact of the Gini index before taxes and transfers on the redistribution is positive and significant in any specification. As expected, governments with stronger market inequalities (i.e., with a more unequal income distribution before tax and cash transfers) provide larger income redistribution through their policies. Significant and negative coefficients are also associated to GDP per capita, meaning that higher income regions are also those with less income redistribution. On the contrary, the share of old population is positively associated to regional redistribution, consistently with the evidence that pensions account for the bulk of total cash transfers in OECD (Joumard et al., 2012), and pension systems can explain a large part of redistribution (Krieger and Traub, 2008).

Results from the second set of regressions are reported in Table 8. The key explanatory variables, i.e., the share of local revenues over general government revenues, has a negative and statistically significant coefficient. A higher decentralization of revenues is associated with lower income redistribution. Although local expenditures are strongly correlated to local revenues (the two indices of local fiscal decentralization have a correlation of 0.845 in our sample; see Table 6), in column 2 we include it as an additional control. Reassuringly, the coefficient of local revenues remains negative and statistically significant, while that of local expenditures is positive, but insignificant. The sign associated to these coefficients are confirmed controlling for the incidence of aggregate public spending and taxation over GDP (column 3), per-capita income at the regional level (column 4) and elderly dependence at the regional level (column 5). In particular, the coefficient of local revenues remains negative and statistically significant, and that of local expenditures remains positive and becomes statistically significant. Spending decentralization is associated with a stronger redistribution in income, while revenue decentralization is associated with less redistribution. Regarding the other controls, Table 8 confirms that the impact of inequality before taxes and transfers on redistribution is always positive, and it is statistically significant for all but one specification. Furthermore, Table 8 shows that the coefficient of public expenditures over GDP is negative and statistically significant and that

of total taxation over GDP is positive and statistically significant (columns 3-5). Contrary to what happens at the local level, we thus find that general government public spending reduces and taxation increases within-region redistribution. The results of columns 4 and 5 also show that higher income regions have smaller redistribution, as the coefficient associated to income per-capita is negative and statistically significant, while the opposite is true for those with a high degree of elderly dependence, confirming previous results shown in Table 7.

Results of the third set of regressions, the two-stages specification, are reported in Table 9. The main evidence provided by the baseline strategy in Table 8 are confirmed by the two-stages regression in (column 1). The regional redistribution of income is negatively associated with revenue decentralization while it is positively associated with spending decentralization. Remarkably, the coefficient estimated with the two-steps procedure is about twice as large as that estimated with the one-step regression of local revenues on income re-distribution. The part of revenue decentralization that is explained by differences in the institutional setting has therefore a stronger effect on intra-regional income redistribution than the part that is due to other factors.

Regarding the remaining explanatory variables, results in Table 9 also confirm that the total public expenditures over GDP and the regional income have a negative and significant association with regional redistribution. A positive and significant association with redistribution is instead confirmed for the market inequality and the total taxation over GDP. The positive association between degree of elderly dependence and redistribution is not significant with this specification. The first stage regression (column 2) shows that there is a positive and significant effect of the fiscal autonomy on revenue decentralization.

Table 10 reports results of the regression shown in Table 8, splitting the sample on the median of Gini before taxation. The impact of revenues decentralization is negative for both subsamples, but it is higher in magnitude for regions with higher before-tax inequality. Indeed, the coefficient associated to local taxation is -0.151 for regions below the sample median (column 2) and -0.242 for regions above the median (Column 1), suggesting that local revenues reduce redistribution more strongly in more unequal regions. The impact of the share of subnational government spending is positive in both subsamples, although the differences are in this case less stark: the estimated coefficient is indeed larger in regions where market inequalities are above the sample median (0.101, Column 1), but it is statistically insignificant and not much different from that estimated on the sample of regions below the sample median (0.083, Column 2), that is statistically significant at the 5 per cent level.

Overall, the results show that revenues decentralization is negatively associated with local redistribution, and the effect is stronger in regions with higher market inequality. From a theoretical perspective, part of these results can be connected to some elements introduced by the second-generation theories of federalism (Weingast, 1995, 2009): limiting government size, the decentralization has the potential to reduce taxation, which is one of the main tools by which the income redistribution can be implemented.

The positive effect of the spending decentralization on redistribution, although less robust, can be partially explained by the arguments introduced by the first generation theories: transfer of powers and responsibilities to lower tiers of government allows for a better match between citizens' needs and public policies, producing welfare improvements (Oates et al., 1972; Tiebout,

1956). From the empirical perspective, our results are partially in line with Neyapti (2006) and Sacchi and Salotti (2014), which show negative association between revenue decentralization and income inequality. On the contrary, our results partially contradict Tselios et al. (2012), who find that greater fiscal decentralization (both spending and revenue) is associated with lower income inequality. The different results likely depend on the three main dissimilarities in our empirical strategy: (i) the choice of the difference between inequality before and after taxation and transfers instead of the level of inequality as the dependent variable; (ii) the choice of the Gini coefficient instead of the Theil index as measure of inequality; (iii) the focus on 15 OECD countries instead of the European Union only.

5 Conclusions

This paper investigates the association between fiscal decentralization and intra-regional redistribution, emphasizing the different role of expenditure and revenue decentralization. From a data perspective, we exploit inequality and fiscal data for 187 regions in 15 OECD countries. We measure redistribution with the difference between inequality before taxation and inequality after taxation. Results show that the regional redistribution is negatively associated with revenue decentralization. Our empirical evidence is robust to changes in the model specifications, including controlling for expenditure decentralization.

The negative association between revenue decentralization and redistribution within regions suggests that the local revenue structure is likely to produce regressive effects at regional level. This may be due in part to the fact that the redistribution is widely recognized as a role of the central government. From a policy perspective, these results call for caution in decentralizing taxes which have a recognized role of redistribution.

One of the main limitations of this study is that of being based on cross-section data. To this regard, further analysis is required to understand if and how changes in decentralization may affect the evolution of income redistribution within regions.

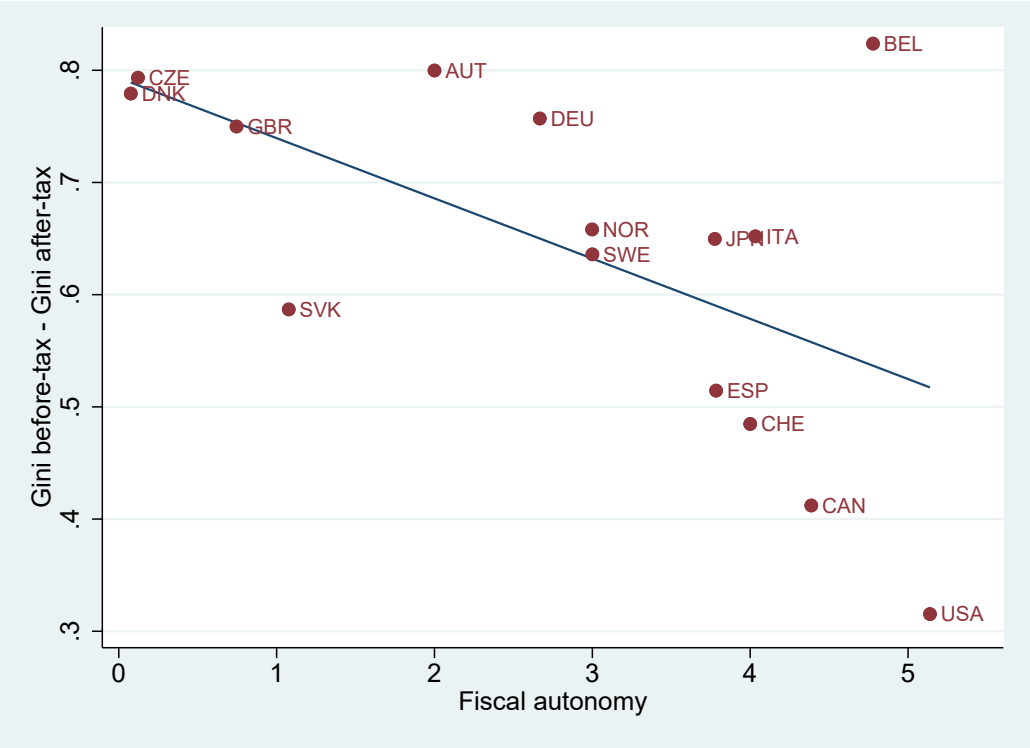

Figure 1: Change in Gini-index before and after taxation and index of regional fiscal autonomy

Table 1: Descriptive Statistics - Aggregate

	Gini after tax	Gini before tax	Change in Gini (before-after)	Fiscal autonomy	Local spending	Local taxation	Public spending (% over GDP)	Total taxation (% over GDP)	GDP pc (regional)	Dependency ratio
mean	0.313	0.479	0.166	3.502	0.430	0.236	43.976	33.444	44,464	0.177
p50	0.304	0.477	0.169	3.784	0.473	0.272	44.944	32.720	41,723	0.171
std. dev.	0.051	0.044	0.045	1.568	0.138	0.142	5.640	6.979	16,775	0.036
coef. var.	0.162	0.093	0.273	0.448	0.322	0.601	0.128	0.209	0.377	0.202
min	0.227	0.370	0.080	0.076	0.155	0.000	32.983	25.92	18,956	0.095
max	0.459	0.594	0.273	5.139	0.775	0.492	56.116	45.89	182,823	0.277
No obs.	187	187	187	187	187	187	187	187	187	187

Table 2: Descriptive Statistics - Country level

	Fiscal autonomy	Local spending	Local taxation	Gov. spending % over GDP	Total taxation % over GDP	GDP pc (regional)	Elderly dep. (regional)	year
Austria	2.000	0.352	0.048	51.648	42.630	48,814	0.181	2013
Belgium	4.778	0.472	0.101	56.116	45.040	52,512	0.163	2013
Canada	4.387	0.775	0.492	40.770	31.130	44,230	0.158	2013
Czech Republic	0.122	0.242	0.013	42.143	33.710	31,356	0.168	2013
Denmark	0.076	0.624	0.272	55.820	45.890	43,660	0.183	2013
Germany	2.667	0.473	0.319	44.944	36.950	41,208	0.216	2013
Italy	4.033	0.280	0.165	50.952	43.830	36,467	0.216	2013
Japan	3.776	0.382	0.000	40.724	25.970	35,526	0.238	2009
Norway	2.998	0.365	0.139	46.251	38.750	45,354	0.164	2014
Slovak Republic	1.077	0.155	0.029	42.232	31.040	34,179	0.133	2013
Spain	3.784	0.453	0.249	45.832	33.120	31,927	0.176	2013
Sweden	3.000	0.494	0.369	50.703	42.380	44,543	0.204	2014
Switzerland	4.000	0.639	0.428	32.983	26.590	62,349	0.171	2010
United Kingdom	0.746	0.220	0.049	45.756	32.720	36,836	0.166	2011
United States	5.139	0.477	0.335	38.350	25.920	55,962	0.148	2014
Total	3.502	0.430	0.236	43.976	33.444	44,464	0.177	

Table 3: Gini before taxation - Within country

Country	Mean	Median	St. dev.	Coeff. var.	Min.	Max.	No. obs.
Austria	0.487	0.479	0.036	0.074	0.443	0.570	9
Belgium	0.522	0.514	0.069	0.132	0.457	0.594	3
Canada	0.430	0.432	0.018	0.042	0.400	0.459	10
Czech Republic	0.457	0.454	0.030	0.065	0.415	0.509	8
Denmark	0.436	0.432	0.011	0.026	0.427	0.455	5
Germany	0.489	0.482	0.031	0.064	0.449	0.544	13
Italy	0.496	0.490	0.039	0.078	0.408	0.568	21
Japan	0.489	0.473	0.041	0.083	0.445	0.578	10
Norway	0.409	0.409	0.015	0.037	0.391	0.433	7
Slovak Republic	0.429	0.430	0.008	0.018	0.420	0.436	4
Spain	0.492	0.487	0.027	0.055	0.431	0.549	19
Sweden	0.432	0.426	0.018	0.042	0.413	0.467	8
Switzerland	0.418	0.413	0.033	0.079	0.370	0.459	7
United Kingdom	0.532	0.535	0.022	0.042	0.494	0.582	12
United States	0.495	0.495	0.035	0.071	0.424	0.560	51
Total	0.479	0.477	0.044	0.093	0.370	0.594	187

Table 4: Gini after tax and cash benefits - Within country

Country	Mean	Median	St. dev.	Coeff. var.	Min.	Max.	No. obs.
Austria	0.272	0.268	0.031	0.115	0.229	0.337	9
Belgium	0.289	0.261	0.060	0.208	0.248	0.358	3
Canada	0.305	0.305	0.016	0.052	0.285	0.331	10
Czech Republic	0.256	0.249	0.020	0.079	0.237	0.300	8
Denmark	0.246	0.237	0.021	0.084	0.234	0.283	5
Germany	0.279	0.280	0.020	0.070	0.236	0.317	13
Italy	0.301	0.302	0.031	0.101	0.245	0.369	21
Japan	0.296	0.297	0.018	0.062	0.271	0.327	10
Norway	0.248	0.243	0.024	0.095	0.227	0.295	7
Slovak Republic	0.270	0.270	0.004	0.015	0.266	0.275	4
Spain	0.326	0.317	0.030	0.092	0.287	0.414	19
Sweden	0.266	0.260	0.026	0.097	0.233	0.314	8
Switzerland	0.283	0.280	0.026	0.091	0.256	0.319	7
United Kingdom	0.306	0.293	0.031	0.101	0.282	0.386	12
United States	0.376	0.376	0.026	0.070	0.320	0.459	51
Total	0.313	0.304	0.051	0.162	0.227	0.459	187

Table 5: Change in Gini (before – after tax and cash benefits) - Within country

Country	Mean	Median	St. dev.	Coeff. var.	Min.	Max.	No. obs.
Austria	0.215	0.216	0.024	0.113	0.181	0.260	9
Belgium	0.233	0.236	0.022	0.095	0.209	0.253	3
Canada	0.125	0.123	0.025	0.202	0.080	0.155	10
Czech Republic	0.201	0.203	0.030	0.148	0.158	0.243	8
Denmark	0.190	0.195	0.012	0.063	0.172	0.202	5
Germany	0.209	0.215	0.038	0.183	0.157	0.273	13
Italy	0.195	0.200	0.022	0.113	0.135	0.226	21
Japan	0.193	0.188	0.026	0.134	0.170	0.251	10
Norway	0.161	0.158	0.019	0.116	0.138	0.188	7
Slovak Republic	0.159	0.161	0.010	0.061	0.145	0.168	4
Spain	0.165	0.174	0.029	0.173	0.107	0.205	19
Sweden	0.167	0.174	0.015	0.093	0.136	0.180	8
Switzerland	0.135	0.128	0.031	0.233	0.112	0.203	7
United Kingdom	0.226	0.231	0.028	0.125	0.174	0.265	12
United States	0.118	0.118	0.020	0.168	0.083	0.168	51
Total	0.166	0.169	0.045	0.273	0.080	0.273	187

Table 6: Pairwise correlations

Variables		1	2	3	4	5	6	7	8	9	10
1	Gini after taxation (regional)	1.000									
2	Gini before taxation (regional)	**0.550**	1.000								
3	Change in Gini (before - after tax; regional)	**-0.579**	**0.363**	1.000							
4	Fiscal autonomy (national)	**0.650**	0.110	**-0.618**	1.000						
5	Local spending (national)	**0.176**	**-0.305**	**-0.494**	**0.450**	1.000					
6	Local taxation (national)	**0.372**	**-0.207**	**-0.617**	**0.589**	**0.846**	1.000				
7	Public expenditure over GDP (national)	**-0.507**	0.049	**0.613**	**-0.459**	**-0.341**	**-0.417**	1.000			
8	Total taxation over GDP (national)	**-0.599**	-0.088	**0.582**	**-0.454**	**-0.279**	**-0.306**	**0.944**	1.000		
9	GDP per-capita (regional)	**0.393**	-0.088	**-0.524**	**0.320**	**0.283**	**0.329**	**-0.305**	**-0.259**	1.000	
10	Elderly dependency ratio (regional)	**-0.503**	0.028	**0.589**	**-0.163**	**-0.18**2	**-0.268**	**0.408**	**0.429**	**-0.387**	1.000

Table 7: Impact of fiscal autonomy on change Gini

	(1)	(2)	(3)	(4)
Gini before taxation (regional)	0.447***	0.479***	0.431***	0.424***
	(0.082)	(0.072)	(0.077)	(0.063)
Fiscal autonomy (national)	-0.019***	-0.014***	-0.012***	-0.013***
	(0.005)	(0.002)	(0.002)	(0.002)
Public expenditure over GDP (national)		-0.001	-0.002	-0.001
		(0.003)	(0.003)	(0.002)
Total taxation over GDP (national)		0.003	0.004	0.002*
		(0.002)	(0.002)	(0.001)
GDP per-capita (regional)			-0.038***	-0.023***
			(0.011)	(0.006)
Elderly dependency ratio (regional)				0.445***
				(0.065)
Observations	187	187	187	187
Adjusted R^2	0.565	0.692	0.751	0.843

Notes: This table reports the results of OLS estimation on the difference between Gini before and Gini after tax and cash benefits. Standard errors, reported in paretheses are clustered at country-level. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Impact of local spending and local taxation on change Gini

	(1)	(2)	(3)	(4)	(5)
Gini before taxation (regional)	0.252*	0.283**	0.455***	0.426***	0.404***
	(0.124)	(0.106)	(0.099)	(0.099)	(0.086)
Local taxation (national)	-0.181**	-0.239*	-0.253***	-0.228***	-0.202***
	(0.062)	(0.117)	(0.049)	(0.035)	(0.042)
Local spending (national)		0.073	0.132**	0.136***	0.113**
		(0.085)	(0.047)	(0.038)	(0.045)
Public expenditure over GDP (national)			-0.005*	-0.005*	-0.004*
			(0.002)	(0.003)	(0.002)
Total taxation over GDP (national)			0.007**	0.007***	0.006**
			(0.002)	(0.002)	(0.002)
GDP per-capita (regional)				-0.042***	-0.034***
				(0.009)	(0.006)
Elderly dependency ratio (regional)					0.297**
					(0.111)
Observations	187	187	187	187	187
Adjusted R^2	0.432	0.442	0.690	0.763	0.803

Notes: This table reports the results of OLS estimation on the difference between Gini before and Gini after tax and cash benefits. Standard errors, reported in paretheses are clustered at country-level. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Impact of local spending and local taxation on change Gini; 2SLS

	(1)	(2)
	Second stage	First-stage regression: RD3
Gini before taxation (regional)	0.570***	0.253
	(0.174)	(0.247)
Local taxation (national)	-0.561***	
	(0.199)	
Local spending (national)	0.405***	0.715***
	(0.148)	(0.073)
Public expenditure over GDP (national)	-0.011**	-0.018**
	(0.006)	(0.008)
Total taxation over GDP (national)	0.011**	0.015*
	(0.005)	(0.008)
Regional per-capita GDP (log)	-0.027**	-0.006
	(0.011)	(0.025)
Elderly dependency ratio (regional)	0.151	-0.525
	(0.288)	(0.588)
Fiscal autonomy		0.023***
		(0.009)
Observations	187	187
Adjusted R^2	0.525	

Notes: This table reports the results of 2-SLS estimation on the difference between Gini before and Gini after tax and cash benefits. Local taxation is instrumented using fiscal autonomy. Standard errors, reported in paretheses are clustered at country-level. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Impact of local spending and local taxation on change Gini; sample split on Gini before taxation

	(1) Above median	(2) Below median
Gini before taxation (regional)	0.457***	0.363***
	(0.125)	(0.081)
Local taxation (national)	-0.242**	-0.151***
	(0.097)	(0.019)
Local spending (national)	0.101	0.083**
	(0.137)	(0.028)
Public expenditure over GDP (national)	-0.003	-0.005***
	(0.005)	(0.001)
Total taxation over GDP (national)	0.004	0.007***
	(0.004)	(0.001)
GDP per-capita (regional)	-0.034***	-0.034***
	(0.008)	(0.005)
Elderly dependency ratio (regional)	0.314*	0.343***
	(0.164)	(0.063)
Observations	94	93
Adjusted R^2	0.757	0.872

Notes: This table reports the OLS results obtained splitting the sample on the median level of the Gini before tax and cash benefits. Standard errors, reported in paretheses, are clustered at country-level. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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