Can fiscal policy mitigate income inequality and poverty?

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Abstract

We study empirically the effects of fiscal policy on income inequality and poverty, using data on a panel of OECD economies spanning the last four decades. To evaluate the distributional effects of government spending we estimate a comprehensive specification, using several measures of income inequality and taking care of potential reverse causality and endogeneity issues. We find that fiscal policy activism is associated with a more equal distribution of income, not only in its middle and bottom components, but also with respect to the income share of top earners. In most cases, government expenditure on consumption seems to be an effective tool for redistributive purposes. We document additional income distribution effects of large fiscal expansions, while fiscal consolidations do not seem to have any additional impact besides those described above.

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1. Introduction

Governments manoeuvre fiscal policy tools to achieve three main goals: macroeconomic stabilisation, efficiency in the allocation of resources, and some desired distribution of income (Musgrave, 1969). Many policymakers view income redistribution as a policy objective, as it creates fairer access to economic, social, and political resources (Bastagli et al. 2012), with potentially beneficial effects on economic inequality. The aim of this paper is to evaluate the relationship of fiscal policies and income distribution over the last 40 years in a panel of 20 advanced economies. This research focus is particularly relevant in the light of the 2007-2008 financial crisis. Most advanced countries are now characterized by significant fiscal imbalances or high stocks of public debt, which are posing serious limits on the fiscal policy actions and tools in the hands of policymakers (Cline and Wolff, 2012). Can those constraints impact on income distribution, too?

In principle, fiscal policy has a redistributive impact through a number of channels, mostly related to the expenditure/transfer side of the budget. Obviously, the trade-off between equity and efficiency objectives of policies is often in itself a source of policy activism, besides decisions related to macroeconomic stabilisation. Public expenditure that targets the poorer parts of the population, such as spending on social security, aims at shifting income towards the middle and bottom parts of the distribution. Expenditure on public services, such as education and health, may reduce inequality by supporting middle-to-low incomes in affording heavy outlays. Those spending categories may work in a redistributive way even indirectly, through human capital accumulation and health conditions. For instance, Benabou (2000) shows that redistributive fiscal policies can relax credit constraints and allow deeper investment in human capital, thereby boosting poor individuals' relative income and decreasing inequality. Indeed, research suggests that reliance on direct effects of taxes and spending as a response to inequality can only be a temporary measure, while sustainable ways to reduce it need to take into account broader opportunities, particularly those related to the labour market (OECD, 2008). Bastagli et al. (2012) note that although the tax-benefit system and changes in its progressivity have direct effects on the distribution of disposable income, policies should support economic efficiency in order to be more effective. Therefore, it is vital to control for all these factors when analyzing the determinants of income inequality, and we do it throughout our empirical analysis.

Interest in the redistributive effects of fiscal policies stems from recent inequality trends. Caminada and Goudswaard (2001) find that in most OECD countries income

inequality has increased in the 1980s and 1990s, and suggest that less generous social policy measures may be at the root of this deterioration. McCall and Percheski (2010) add that the trend continued up to 2010, particularly due to the rising share of income going to the top earners. The latter claim is in part supported by Piketty and Saez (2006) and Atkinson et al. (2011), who document a substantial increase of the top income shares in the USA and other English-speaking countries starting in the mid-1980s, and a flat dynamics for most of continental Europe. On the other hand, no discernible pattern to changes in income inequality has been detected so far in the aftermath of the Great Recession (Jenkins et al., 2011).[1]

This apparent consensus on the evolution of income distribution masks several measurement issues that complicate the task of studying the behaviour of inequality. For instance, Anand and Segal (2008) argue that it is impossible to reach a definitive conclusion on the direction of change in global inequality over the last three decades of the twentieth century. Heterogeneous estimation techniques and some data gaps and errors are at the roots of this argument. Atkinson and Brandolini (2001) express the same kind of concerns focusing on OECD countries and on the use of secondary datasets (the first of the authors has since then moved on to the construction of a novel dataset - see Atkinson, 2003 - and we use these data too in our analysis). Smeeding (2002) finds no evidence of common features in the G20 countries using micro-data for the Eighties and Nineties.

In our paper we deal with these concerns by using inequality data taken from a number of different sources and checking whether results depend on the choice of particular series. Our aim is to offer a comprehensive analysis on the effects of fiscal policy on income distribution. We measure fiscal policy with both a stock variable (i.e., government debt as a percentage of GDP, accounting for highly persistent fiscal impulses) and with a flow variable (i.e., government spending – fiscal-flow variables are more routinely used in the literature - see e.g. Muinelo-Gallo and Roca- Sagalés, 2011). We also investigate the effects of large fiscal consolidation/expansion episodes in additional specifications of our empirical model. Given that reverse causality and endogeneity issues are commonly found to affect this type of analyses, we employ adequate methods to take care of them (such as using lagged regressors and adopting instrumental variables estimation).

Our results suggest that fiscal policy does indeed affect the distribution of income. Not only are government policies able to reach the poorer parts of the population, but they

[1] The same issue has been investigated for countries other than advanced ones (e.g., Cubero and Hollar, 2010 concentrate on Central America), but our review is instrumental to the empirical analysis that we conduct on a sample of OECD countries.

can also achieve a significant amount of redistribution by acting on the middle and, even if somehow less effectively, the top parts of the income distribution. Government expenditure seems to be the main tool to achieve these goals. We find that increasing government spending by 2 to 5 points of GDP can reduce the Gini index by 1 point, a non-negligible impact given the coefficient's stability over time. A slightly larger increase (4 to 6 GDP points) is needed in order to reduce the top 1% income share by 1 point. This is another economically meaningful result, given that the average top 1% income share in our sample is equal to 7. Further estimates centred on the role of large fiscal consolidation and expansions suggest that the latter increase income inequality, although the equalizing role of government spending does not disappear during these episodes. On the contrary, large fiscal consolidations are not associated to significant changes in the income distribution, beyond the above mentioned effects. Thus, depending on the severity of the measures taken to consolidate public finances, the redistributive consequences can be considerable.

The remainder of the paper is organized as follows. Section 2 contains a review of the literature on the determinants of income inequality, with a focus on the impact of fiscal policy. Section 3 describes the data and the models used in the empirical analysis. Section 4 contains the results of the estimations, and Section 5 concludes.

2. Literature Background

The empirical literature has long acknowledged that inequality tends to vary widely across groups of countries, while it is relatively persistent within countries (Li et al., 1998). At the roots of those country differences, many authors listed political and institutional factors, such as the quality of institutions or being a democracy (Sirowy and Inkeles, 1990; Barro, 2000). Recently, there has been a revival of interest in the relationship between income inequality and growth. This research has yielded conflicting empirical results. While some evidence suggests a negative trade-off between growth and inequality, other studies have tended to support a positive relationship (see e.g. Barro, 2000). The Kuznets (1955) hypothesis, which claims that growth first increases and then reduces income inequality, has been extensively studied. It is now customary to include the level of GDP and its squared value among the determinants of income distribution, given its potential asymmetric effects (see, e.g., Sepulveda and Martinez-Vazquez, 2011). Other factors such as human capital accumulation (Tanzi, 2000, Afonso et al., 2010) and trade openness (Barro 2008) also received attention in the light of potential effects on inequality through their influence on wages and employment.

Relatively little attention has been paid so far to the empirical investigation of the role of fiscal policy and government intervention. Bastagli et al. (2012) review the literature addressing how fiscal policy may affect the distribution of income, and cite various studies claiming that the expenditure side has been especially important in reducing income inequality in advanced countries over the last decades. However, many of these studies lack a proper econometric analysis, as they mostly rely on static comparisons and calculations (e.g., Brandolini and Smeeding, 2009; Paulus et al., 2010). There are only few examples of econometric analyses on the determinants of income distribution that investigate the role played by fiscal policy variables. Public spending at large has normally been found to significantly affect income inequality. Baldacci et al. (2002) evaluate the effects of social security and health expenditure. Mulas-Granados (2005) studies social spending as well as the cyclically adjusted fiscal balance, while Bertola (2010) only the former. Direct and indirect taxes have also been used in econometric analyses of inequality, with most authors finding equalizing effects (Muinelo-Gallo and Roca-Sagalés, 2011; Afonso et al., 2010). Wolff and Zacharias (2007) find that net government expenditure also had an equalizing effect in the USA between 1989 and 2000. However, as we argue below, there are reasonable concerns as to the robustness of some of those results, essentially because of the uncertain effects of the discretionary as opposed to the automatic components of fiscal flows and therefore their endogeneity with respect to the business cycle.

The recent sharp increases in budget deficits and debt positions in most advanced countries in response to the Great Recession have sparked an interesting debate on the effects of large changes in fiscal positions and balances on economic activity. While most of the studies concentrate on the impact of large consolidation and expansion episodes on economic growth (Alesina and Ardagna, 2010; IMF, 2010; Perotti, 2012), Agnello and Sousa (2012) and Ball et al. (2013) investigate how fiscal consolidation impacts on income inequality. They find that inequality rises when consolidation is implemented, and that this effect is mostly driven by spending adjustments. Those results, although interesting and novel, are far from satisfactory. For instance, there is an ongoing debate among economists on how to correctly identify large consolidation (and expansion) episodes. While Nickel et al. (2010) recover consolidation episodes by looking at large changes in government debt stocks, the IMF (2010) examines analytically budget policy documents to identify consolidation periods. Moreover, are the estimated effects simply the result of changes in government expenditure,

taxes and debt positions, or do fiscal expansions and consolidations affect the income distribution *per se*?

The value added of our paper lies in the gathering of new and robust evidence about the effects of fiscal policy on the distribution of income, taking into account a number of critical methodological issues. First, we use a number of different inequality measures in order to ensure that results are not driven by specific data sources. Second, we control for various fiscal policy indicators to achieve a better understanding of the extent to which the government can affect income inequality, if at all. Third, we study the normal fiscal stance as well as episodes of marked fiscal consolidation and expansion.

3. Data and model

The baseline specification that we implement in our empirical analysis is as follows:

$$inequality_{i,t} = \alpha_0 + \alpha_1 public\_debt_{i,t-x} + \alpha_2 govt\_size_{i,t-x} + \boldsymbol{\beta}_j^{'} \mathbf{controls}_{i,t-x} + u_{i,t}, \quad (1)$$

where $inequality_{i,t}$ is measured using various indicators extracted from a number of data sources (see below for details, also laid out in the Data Appendix). Our main explanatory variables are the following: i) $public\_debt_{i,t-x}$ is the stock of gross public debt divided by GDP, the standard series used when investigating government debt in econometric frameworks; ii) $govt\_size_{i,t-x}$ is general government final consumption expenditure divided by GDP, a commonly used fiscal flow variable.[2] In accordance with most of the literature, we do not use taxes and transfers to avoid the endogeneity issues arising from the direct impact on the net income distribution owing to the progressivity of the revenue system.

The model is enriched with the following controls often included in studies of economic inequality (see, e.g. Barro, 2000, 2008): 1) the logarithm of real GDP per capita, both in levels and squared ($gdppc_{i,t-x}$ and $gdppc\_sq_{i,t-x}$), in order to control for the Kuznets hypothesis (Moran, 2005); 2) $open_{i,t-x}$ is trade openness, as measured by exports plus imports divided by GDP; 3) $educ_{i,t-x}$ is a proxy for human capital measured by secondary schooling

[2] Note that we use WDI data and not the series taken from the Penn World Tables (Heston et al., 2012), the other frequently used source for this measure, given the shortcoming properly noted by Knowles (2001), essentially the fact that the latter source calculates the series imposing a set of PPPs prices that may yield imprecise values.

enrolment;[3] 4) $liberties_{i,t-x}$ is an ordinal variable measuring the extent of civil liberties, with lower values corresponding to more liberties (see the Appendix for details); 5) $infl_{i,t-x}$ is inflation based on the CPI; 6) $unempl_{i,t-x}$ is the unemployment rate; 7) $pop\_gr_{i,t-x}$ is population growth. A linear trend is also added to the set of controls, and $u_{i,t}$ is an error term.

The nature of the dependent variable makes it unlikely to observe contemporaneous effects of the explanatory variables, as economic inequality is persistent, and changes only slowly. Therefore, we use lagged values of all the right-hand-side variables, which permits us to control for potential reverse causality issues. For the sake of brevity we will present the results obtained with $x = 2$ (i.e., the second lag of all regressors is used), but these are quite consistent with those obtained when using the first or the third lag (full results available upon request).

We firstly estimate equation (1) with both random and fixed effects (RE and FE, respectively), as it is customary in this type of analysis (see e.g. Barro, 2000, 2008; Muinelo-Gallo and Roca-Sagalés, 2011). Given the high cross-country variability of economic inequality and its relative stability over time, both estimation techniques may yield interesting and meaningful results. One may raise some endogeneity concerns: fiscal policy can affect economic inequality, but tax and spending decisions may be motivated by the desire to mitigate it, producing a possible two-way relationship between the variables. This is why we also report the estimates obtained by using system GMM where we consider the fiscal variables to be endogenous, and we instrument them using two of their lags (the fourth and the fifth, in the case of $x = 2$), along with the rest of the regressors.

One may think that including GDP among the controls also poses some endogeneity concerns, as it implies that inequality has no impact on it. It has indeed been claimed in the literature that inequality may affect economic growth (see, e.g., Ramos and Roca-Sagalés, 2008). However, we follow the modelling strategy adopted by, among others, Barro (2008), and assume that while the level of GDP (development) can affect inequality, the latter can only affect its growth rate (see also Bourguignon 2004, Persson and Tabellini 1994, Galor and Zeira 1993). Moreover, the existing empirical evidence does not point towards large effects of inequality on either GDP or economic growth.

One the key issues from a methodological point of view concerns the nature and consistency of the measures of inequality. It is well-known that such data suffer from

[3] The average years of secondary education would have been the first choice to control for human capital, but this series is only available once every 5 years (Barro and Lee, 2010).

shortcomings related both to measurement and data availability. We deal with them by employing a number of different and alternative measures of economic inequality, and evaluate whether the choice of a specific series turns out to be critical for the analysis. First, we utilize multiple available Gini indices, whose properties make it a variable mostly indicative of how inequality is shaped around the middle of the income distribution. Second, we complement the analysis by looking at the upper part of the distribution with the help of variables that measure the top income and earnings shares. Finally, we also employ a widely known indicator of poverty, i.e. the percentage of the population living below 60% of the median income.

As for the Gini index, arguably the most commonly used data in the literature are those of the UN-WIDER dataset (see e.g. Barro 2008, Muinelo-Gallo and Roca-Sagalés 2011, Afonso et al., 2010). Thus, we use the WIDER Gini index calculated on net income ($gini\_UN_{i,t}$) for most of the countries in the sample, and we control with a dummy for the cases in which gross income is used instead. We also use two alternative Gini coefficients based on net income: one taken from the Standardized World Income Inequality Database (SWIID) ($gini\_SWIID_{i,t}$, as in Agnello and Sousa, 2012)[4], and one taken from the dataset assembled by Atkinson and Morelli (2011 - AM from now on - $gini\_AM_{i,t}$). We add to these three series two Gini indices based on gross income: the first is from the Texas Inequality Database, the second again from the SWIID database ($gini\_gross\_Texas_{i,t}$ and $gini\_gross\_SWIID_{i,t}$, respectively).

The data for the upper part of the distribution come from the World Top Incomes Database (WTID, henceforth) and also from AM (2011). We use the income shares of the top 1% and 10% of the distributions from the former ($top1\_WTID_{i,t}$ and $top10\_WTID_{i,t}$ respectively). As for the AM data, we use the income share of the top 1%, and the earnings share of the top 10% of the distribution ($top1\_AM_{i,t}$ and $top10\_earn\_AM_{i,t}$ respectively). Finally, we use a poverty series (also constructed by AM, 2011), defined as the percentage of households living below 60% of the median equivalised disposable income of the country ($poverty\_AM_{i,t}$). Table 1 presents descriptive statistics for all the variables employed in the analysis.

INSERT TABLE 1 ABOUT HERE

[4] The SWIID data are based on the LIS dataset.

What emerges from a quick glance at the descriptive statistics of the inequality series is that numbers vary widely, although similarly defined variables do present reassuring similarities. Figure 1 plots the panel average values (and their highest and lowest values) of the three Gini indices calculated on net income. The behaviour of the three series is broadly consistent over time, and their overall average values are similar. Nevertheless, there are significant differences in their standard deviations, as well as in their minimum and maximum values. Figures 2 and 3 are drawn for the Gini based on gross income and for the top-of-the-distribution measures of inequality, respectively.

INSERT FIGURES 1, 2, & 3 ABOUT HERE

Judging from the panel averages, the Gini coefficients based on gross income seem to be broadly consistent with each other, particularly as to their behaviour over time, but again with non-negligible quantitative differences. Simple pairwise correlations among the various inequality series never exceed 0.90, and are not always significant at standard levels (see Table 2 for those among the Gini indices), supporting the choice of a variety of inequality series on robustness grounds. Moreover, the correlations show a certain consistency across the Gini indices based on net income, while they point towards serious differences between the two indices based on gross income.

INSERT TABLE 2 ABOUT HERE

4. Estimates

4.1 Analysis based on Gini indices

Table 3 reports the RE, the FE, and the system GMM estimates of model (1), computed in order to detect the impact of fiscal policy on the three alternative Gini indices based on net income (used separately as the dependent variable).

INSERT TABLE 3 ABOUT HERE

The clearest regularity emerging from the estimates is a significant relationship between the fiscal variables and economic inequality, no matter the estimator we use. In particular, the coefficients of both debt and government size are negative and statistically

significant in the RE and FE regressions. According to these estimates, an increase by 2 to 6 GDP points of government size reduces the Gini index by 1 point (the elasticities implied by the estimated coefficients at the mean values of the variables range between -0.17 and -0.49). As for debt, a much larger change (7 to 25 points) is needed in order to attain a similar reduction (debt elasticities range between -0.04 and -0.13). It should be acknowledged that the two series are bound to (at least partially) co-move if the additional expenditure is not matched by adequate revenues.

The GMM estimates shed further light on the importance of the fiscal variables by revealing that, once endogeneity is taken into account, it is the fiscal flow variable that mostly affects the distribution of net income, rather than the stock of public debt. In particular, the debt coefficient is only significant (but with a positive sign) in the specification with the WIDER Gini index. On the other hand, negative and significant coefficients are attached to government expenditure across all three specifications, making this result robust to the choice of the inequality measure. As for its magnitude, an increase of 1.5 to 2 points of GDP is enough to deliver a 1 point fall of inequality in net income distribution measured by the Gini coefficient.

Further interesting insights arise from the remainder of right-hand-side variables. We find no evidence supporting the Kuznets hypothesis, with the GDP (both level and squared) coefficients being mostly not statistically different from zero.[5] This is not particularly surprising, given the mixed evidence found in the literature on this point (see, e.g., Barro, 2000; Deininger and Squire, 1998). Openness, education, and civil liberties seem to play an equalizing role (as already found by, respectively, Reuveny and Li, 2003, and De Gregorio and Lee, 2003), while population growth exerts opposite effects. However, the coefficients associated to these variables are estimated very imprecisely, with large standard errors and, therefore, low statistical significance.

To complete our analysis on the middle part of the income distribution we now present the results of the estimation of model (1) with the two Gini indices based on gross income.

[5] Coefficients are significant at 5 and 1% levels in the RE and FE estimates using SWIID inequality data. In those cases there is evidence of an inverted U-shape (given the positive *gdppc* coefficient, and the negative *gdppc_sq* one). The tipping point can be calculated by dividing the *gdppc* coefficient by two times the coefficient of the squared value of GDP, and it is the other interesting information (apart from the shape of the relationship) arising from the coefficients of the two GDP variables. In this case the point lies within the sample range at *gdppc* = 9.65.

INSERT TABLE 4 ABOUT HERE

Results displayed in Table 4 are harder to frame, as there seems to be little in common between the estimates obtained with the two alternative dependent variables (which are not even significantly correlated, see Table 2). According to the data retrieved from the Texas Income Inequality Database, it seems that government spending exerts an equalizing effect on the distribution of gross income, although the result is not consistent across all estimation methods. In the case of debt, the GMM results contradict the RE and FE ones, possibly suggesting once again that the equalizing effect strongly pertains to the flow, not the stock variable. However, these findings are not robust to the choice of the dependent variable. There are no discernible effects of the fiscal variables on the SWIID Gini index (apart from the negative debt coefficient obtained with the RE estimator), leading us to conclude against any sizeable effect of government actions on the distribution of gross income. Little can be said on the rest of the variables. What emerges is an equalizing role for inflation and civil liberties, and again the opposite effect for population growth, but statistical significance is mostly very low, and varies across the two specifications.

All in all, it seems clear that results based on the Gini indices calculated using net income are more informative and robust than those based on the indices calculated from gross income. The next sub-section contributes to the analysis of the whole distribution by presenting the results for the top and bottom parts of it.

4.2 The analysis of the upper part of the distribution and of poverty

Tables 5 reports the GMM estimates of the specifications dealing with inequality measures based on the upper (two WTID and two AM series) and the lower parts of the income distribution (the AM poverty series).[6] The long-term interest rate (*lt_rate*) is added to the vector of controls when using a dependent variable dealing with the upper part of the distribution, given the findings by Piketty (2011) and Piketty and Zucman (2012). These authors claim that an increase in the returns on wealth and inheritance played a crucial role in the recent rise of inequality in developed countries, through the key redistributive mechanism of the interest rate being higher than the rate of economic growth.

[6] The RE and FE results (available upon request) are not reported for the sake of brevity, but are broadly consistent with those obtained with GMM.

INSERT TABLE 5 ABOUT HERE

As in the case of the Gini indices calculated using net income, fiscal policy emerges as one of the key determinants of a more equal income distribution. In three out of four of the top income shares' specifications (*top1_WTID*, *top10_WTID*, and *top1_AM*) government expenditure is associated to negative and statistically significant coefficients. Quantitatively, an increase of 4 to 5 points of GDP reduces the top 1% share by one point. Given that its average is not higher than 8 (according to both sources of the data, see Table 1), the effects is non-negligible, although the implied increase in public spending is certainly demanding. An increase equal to 2 points of GDP is needed to reduce the top 10% share, *top10_WTID*, by one point (its sample average is higher, though, and equal to 31.06). As for the top 10% earnings share constructed by AM (2011), *top10_earn_AM*, government debt, not government size, has a significant effect, still in an equalizing way. A debt increase of 4 GDP points reduces that share by 1 point (the average value of *top10_earn_AM* is 182.61).

Turning to poverty, government expenditure again emerges as the key fiscal variable, with a negatively estimated coefficient equal to -0.66. All else equal, 1.5 points of public consumption are needed to lower the percentage of households living below 60% of the country's median equivalised disposable income by one unit. Unemployment, on the other hand, account for higher inequality both at the top and bottom parts of the income distribution. The negative coefficients associated to the long-term interest rate does not seem to corroborate the claims in Piketty (2011) and Piketty and Zucman (2012), although this may signal that the rate of return on wealth relevant for the top income earners (i.e., the one to be compared to the rate of economic growth) may differ from the one used in our regressions. Finally, it emerges a strong role of education in reducing poverty, while the impact of the former on the top income measures is estimated to be not statistically different from zero.

To conclude, it seems that fiscal policy indeed affects the income distribution not only in its middle parts, as suggested by the Gini indices analysis, but also at its top and bottom sections. These interesting results obtained on the distributional effects of fiscal policy call for further investigation of the role of government policies. In particular, recently the literature has devoted attention to the macroeconomic consequences of large fiscal consolidations and, although to a lesser extent, of large fiscal expansions. The next sub-section extends our empirical analysis to deal with them.

4.3 Large consolidation and expansion episodes

One controversial issue in the literature on fiscal consolidation/expansion lies in the identification of the episodes during which governments went through these types of adjustments. In order to ensure the robustness of our results, we identify the consolidation events in two different and mutually alternative ways (while the expansion periods can only be identified using the first method):

i) by adopting the definition laid out in Nickel et al. (2010): first split the sample into two groups, depending on the observations being characterized by year-on-year stable/increasing or decreasing debt/GDP ratio; next, select years in which the country experienced a cumulative increase/decrease of at least 10% of the same ratio over at least 5 consecutive years.

ii) by using the IMF data on deficit-driven consolidations, available from 1978 to 2009 for 16 economies (Devries et al., 2011).

In order to study the effects of these particular episodes we add to model (1) a dummy variable ($episode_{t-x}$) taking the value 1 in years when fiscal consolidation has been carried out and, in a different specification, a dummy equal to 1 when large fiscal expansions occurred and equal to 0 elsewhere. For the sake of brevity, we only present the GMM results. A lagged effect of the episodes is assumed to be at work, just like for the rest of the explanatory variables. Table 6 reports the results with the net income Gini indices used as dependent variables. We exclude the Gini indices calculated on gross income from this part of the analysis given the inconsistent results obtained above.

INSERT TABLE 6 ABOUT HERE

The addition of dummies controlling for large fiscal consolidations and expansions does not alter the results obtained so far. In particular, the main finding of an equalising role of government expenditure is confirmed. It does not emerge a role for the fiscal episodes *per se*: the *episode* coefficients are mostly not statistically different from zero, and their signs vary across the specifications of the model. Given the properties of the Gini index, it can be concluded that large fiscal expansions and consolidations do not affect the middle part of the income distribution, beyond the effects already documented above for government expenditure. This implies that, according to our estimates, the documented inequality-

increasing effects of consolidations (Ball et al., 2013) simply arise from the consequences of the expenditure cuts put in place in order to improve public finances.

We now focus on the rest of the distribution by adding the episode dummies to the models employing the top income (and earnings) shares and the poverty series as dependent variables. For the sake of brevity, Table 7 contains the estimated coefficients of the three fiscal variables (*public_debt*, *govt_size*, and *episode*), keeping the same set of controls as for the previous estimates.

INSERT TABLE 7 ABOUT HERE

These additional estimates confirm the main results obtained under the baseline specifications, and no additional results are found for the consolidation episodes. The coefficients associated to the latter vary depending on the definition of the episodes themselves. However, the large standard errors associated to most of the coefficients prevent us from expanding on this. The models estimated with the large fiscal expansion dummy do carry interesting information, suggesting that an increase in public debt in the recent past leads to an increase of the income shares of the richest individuals in the economy (the increase is sizeable in all specifications). However, they are not the only individuals to benefit from large expansion, as the percentage of households below median income decreases following the same type of episodes (by more than 1 point).

5. Concluding Remarks

In this paper, we investigate the redistributive impact of fiscal policy in a panel of 20 advanced economies over the last 40 years. In order to capture all the possible ways in which governments may affect the income distribution we measure fiscal policy using both a flow and a stock variable (government expenditure and public debt, respectively). We also control for episodes of large consolidations and expansions in an extension of the benchmark analysis to check whether the redistributive function is affected by these unusual stances. For robustness purposes we use several measures of income inequality taken from different sources. In addition to the Gini index, mostly informative on the middle part of the distribution, we use top 1 and 10% income and earnings shares, as well as a measure of poverty.

The main evidence of the study provides support to the notion that fiscal policy has a significant impact on income distribution. In particular, we find that changes in government expenditure exert a considerable equalizing role. In most cases it overshadows the importance of government debt, and that of large fiscal stance episodes. As for the latter, only large fiscal expansions seem to have additional effects on income distribution, while large fiscal consolidations do not have additional effects beyond those related to government consumption and debt.

These results suggest that governments in developed countries do have the chance, for instance, of mitigating the distributional impact of unfavorable macroeconomic shocks. The potential effects of fiscal policies on the Gini index or the top income shares can be considerable, with significant impacts starting with public expenditure increases equal to 2 percentage points of GDP. Such expenditure changes are non-trivial, particularly given the current state of public finances in most developed countries. The 2007-08 financial crisis and its consequences led to large increases in public debt positions and to large deficits in many developed countries, particularly those adhering to the European Monetary Union. Our results suggest that in the long term high debt might imply narrower room for equality-enhancing interventions. Government policies rebalancing fiscal imbalances through expenditure cuts may turn out as particularly costly in terms of equality in the distribution of income.

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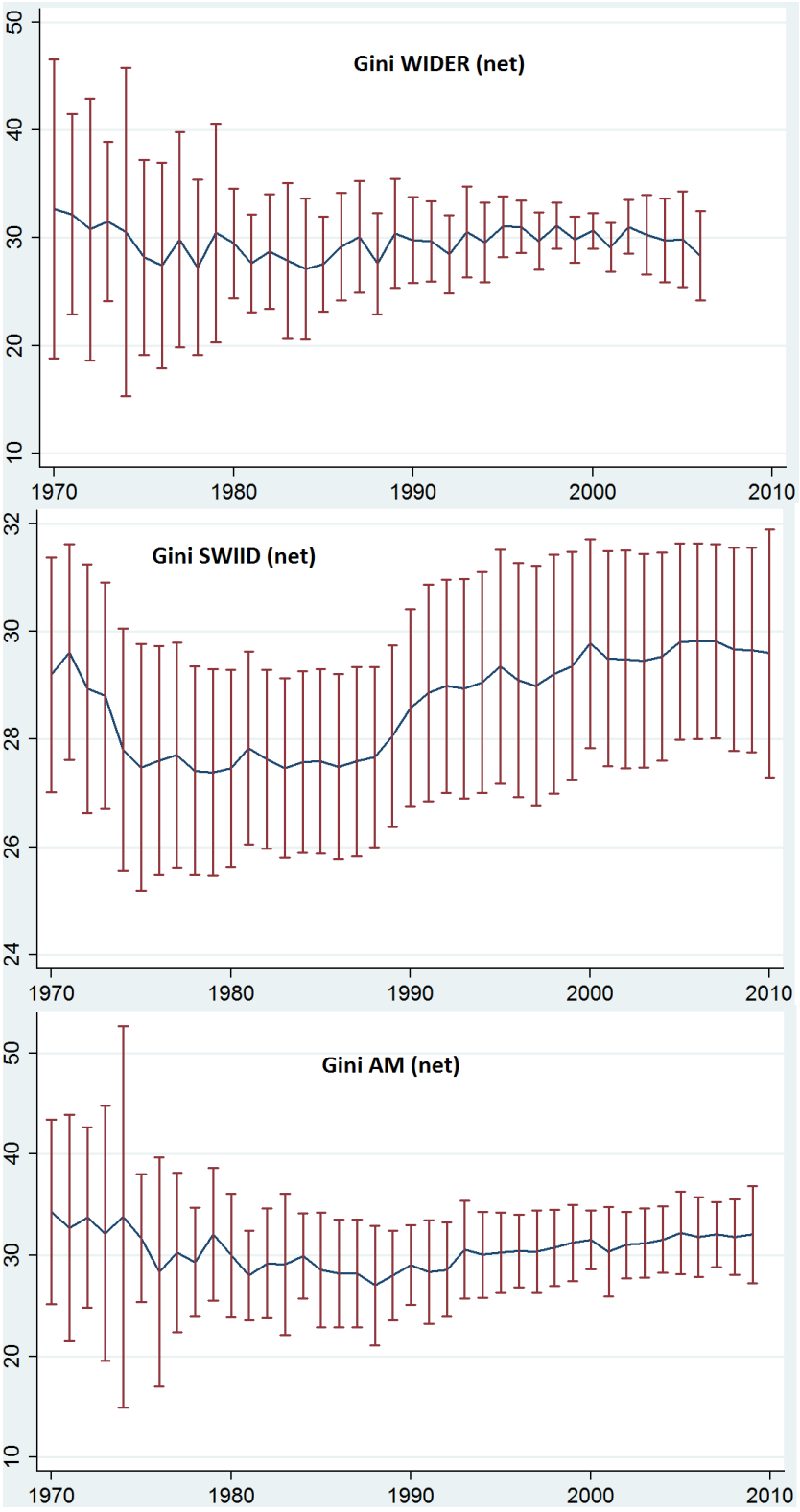
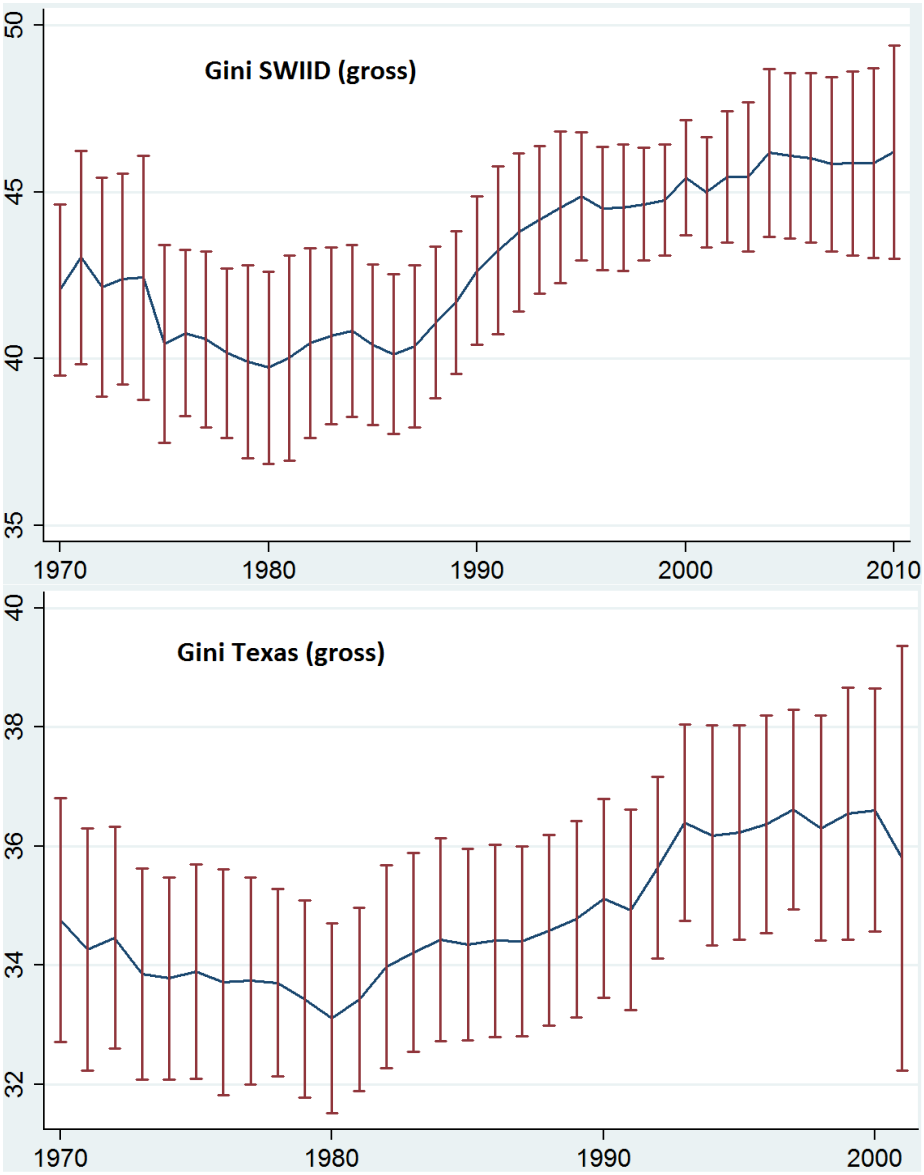
Figures and Tables

Figure 1: the three Gini indices calculated on net income



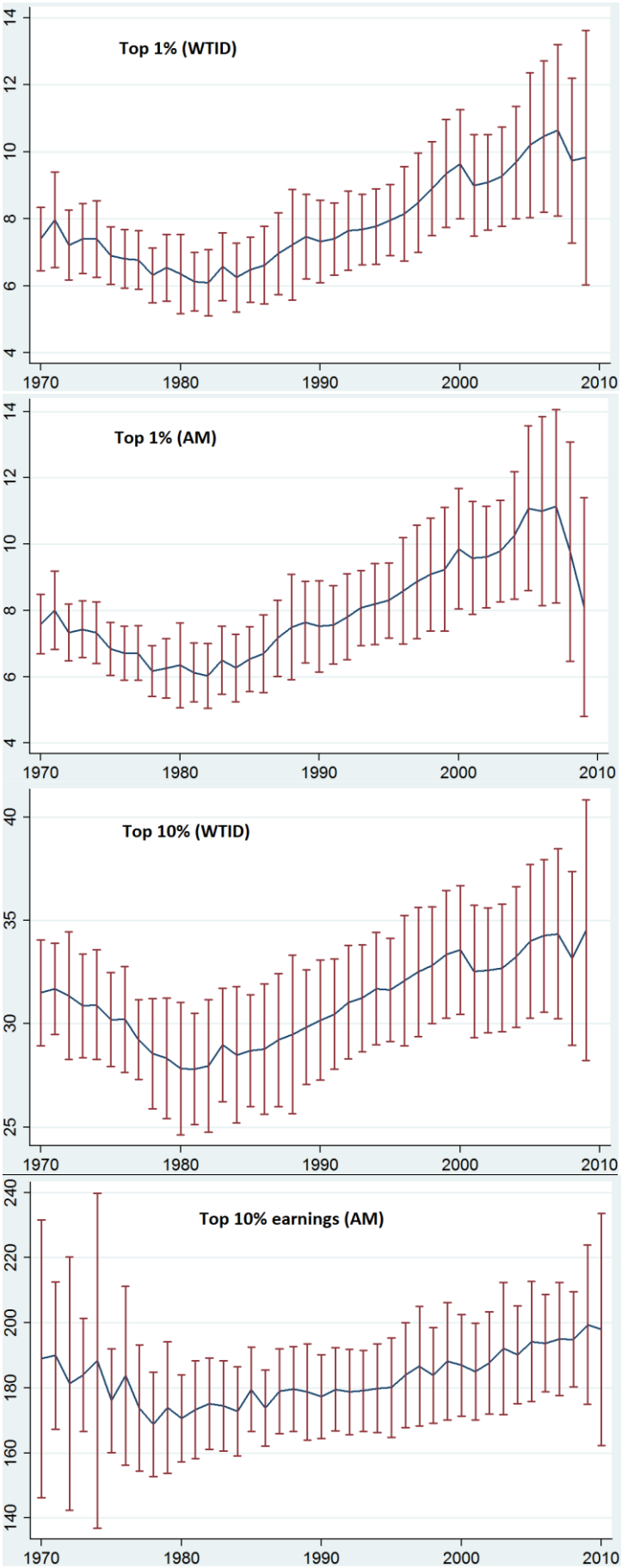
Source: authors' elaborations.

Figure 2: the three Gini indices calculated on gross income



Source: authors' elaborations.

Figure 3: the top-of-the-distribution inequality measures



Source: authors' elaborations.

Table 1: descriptive statistics

	Obs.	Mean	Std. dev.		Min.	Max.
			between	within		
gini_UN	320	29.70	4.89	2.36	18.00	42.10
gini_SWIID	809	28.67	3.66	2.06	19.70	37.47
gini_AM	353	30.39	4.83	2.59	19.70	45.80
gini_gross_SWIID	809	43.09	4.18	3.91	25.02	61.69
gini_gross_Texas	596	34.73	3.22	1.93	25.89	46.23
top1_WTID	529	7.88	2.04	1.72	3.80	18.33
top10_WTID	493	31.06	4.38	2.79	18.77	46.26
top1_AM	489	7.90	1.79	1.85	3.49	18.29
top10_earn_AM	393	182.61	20.54	10.40	142.50	254.50
poverty_AM	276	14.64	3.68	1.85	6.40	22.90
public_debt	861	54.24	19.39	23.50	1.72	220.39
govt_size	850	19.25	3.63	1.94	9.78	29.79
gdppc	840	10.09	0.20	0.25	8.92	10.84
open	840	52.26	23.52	18.20	9.81	163.49
educ	798	0.80	0.10	0.16	0.23	1.45
liberties	759	1.33	0.43	0.51	1.00	6.00
pop_gr	840	0.58	0.35	0.37	-1.10	3.38
unempl	787	6.18	2.62	2.47	<0.01	20.06
infl	774	5.30	2.22	4.27	-4.58	28.57

Source: authors' calculations. T = 41 years at most (1970-2010). N = 20 countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, the USA). Note: there are no *gini_AM* data for the following countries: Austria, Belgium, Denmark, Greece, and Ireland.

Table 2: correlations among the various Gini indices

	gini_UN	*gini_SWIID*	*gini_AM*	*gini_gross_SWIID*	*gini_gross_Texas*
gini_UN					
gini_SWIID	0.79*				
gini_AM	0.86*	0.86*			
gini_gross_SWIID	0.24*	0.32*	0.24*		
gini_gross_Texas	0.57*	0.66*	0.65*	0.06	

Source: authors' calculations. * denotes 5% (or less) statistical significance.

Table 3. Three specifications, net income Gini indices (RE, FE, and GMM estimates)

	RE			FE			GMM		
	gini_UN	*gini_SWIID*	*gini_AM*	*gini_UN*	*gini_SWIID*	*gini_AM*	*gini_UN*	*gini_SWIID*	*gini_AM*
$govt\_size_{t-2}$	-0.36***	-0.26***	-0.65***	-0.35*	-0.20	-0.61***	-0.91***	-0.56***	-0.71***
	(-3.78)	(-4.28)	(-7.32)	(-1.97)	(-1.38)	(-3.55)	(-4.69)	(-4.55)	(-5.19)
$public\_debt_{t-2}$	-0.06***	-0.03***	-0.02*	-0.07***	-0.03**	-0.03	0.09**	0.02	0.06
	(-5.76)	(-5.16)	(-1.92)	(-4.08)	(-2.14)	(-1.33)	(2.47)	(1.04)	(1.47)
$gdppc_{t-2}$	-105.00**	90.70***	-41.90	-97.30	84.90**	-35.30	-212.00	92.30	90.76
	(-2.03)	(4.87)	(-0.76)	(-1.35)	(2.19)	(-0.40)	(-0.97)	(1.46)	(0.67)
$gdppc\_sq_{t-2}$	4.73*	-4.68***	1.98	4.22	-4.38**	1.97	10.80	-4.91	-4.51
	(1.89)	(-5.16)	(0.73)	(1.25)	(-2.32)	(0.48)	(0.99)	(-1.56)	(-0.68)
$open_{t-2}$	-0.07***	-0.04***	-0.02	-0.08***	-0.04	0.02	-0.03	-0.02	-0.12**
	(-4.49)	(-5.68)	(-1.43)	(-3.13)	(-1.46)	(0.36)	(-0.85)	(-1.11)	(-2.19)
$educ_{t-2}$	0.48	-0.86	-4.02***	0.83	-0.73	-2.76	-8.56	-0.92	-9.23***
	(0.41)	(-1.51)	(-3.48)	(0.43)	(-0.61)	(-1.75)	(-1.63)	(-0.41)	(-3.40)
$liberties_{t-2}$	1.06***	0.40**	0.51	0.99***	0.42	0.72	0.18	-0.08	-1.43
	(3.47)	(2.03)	(1.31)	(3.11)	(0.97)	(1.24)	(0.13)	(-0.09)	(-1.09)
$infl_{t-2}$	-0.13*	-0.088**	-0.10	-0.14	-0.095*	-0.11	-0.003	0.10	0.18
	(-1.86)	(-2.46)	(-1.40)	(-1.34)	(-1.97)	(-1.48)	(-0.02)	(1.06)	(1.29)
$unempl_{t-2}$	0.16*	-0.041	0.25***	0.12	-0.058	0.34**	0.30	-0.014	0.07
	(1.91)	(-0.86)	(3.06)	(0.87)	(-0.72)	(2.85)	(1.20)	(-0.11)	(0.36)
pop_gr_{t-2}	1.18**	0.19	0.98*	1.14	0.081	1.10	-0.57	3.07***	2.99**
	(2.47)	(0.56)	(1.79)	(1.72)	(0.094)	(1.45)	(-0.33)	(2.98)	(2.56)
trend	0.52***	0.25***	0.21***	0.59***	0.24**	0.046	0.019	0.28***	0.33***
	(9.34)	(7.50)	(4.17)	(5.87)	(2.21)	(0.27)	(0.11)	(4.23)	(3.27)
Constant	607.00**	-406.00***	262.00	580.00	-379.00*	197.00	1090.00	-400.00	-411.00
	(2.27)	(-4.23)	(0.92)	(1.53)	(-1.90)	(0.42)	(0.99)	(-1.26)	(-0.60)
Observations	278	633	312	278	633	312	278	633	312
R-squared[$]	0.18	0.40	0.45	0.65	0.26	0.61			
Hansen J statistic							1.00	1.00	1.00
AR(2) A-B test							0.29	0.69	0.55

Note: *t*-statistics in parenthesis based on robust standard errors (*z*-statistics for the RE estimates). ***, **, * denote significance at 1%, 5% and 10%, respectively. In the *gini_UN* specifications the observations where gross income is used are taken care of by adding a dummy (not reported). *p*-values are reported for both the Hansen J and the AR(2) statistics for the GMM estimates. $: the overall R^2 is reported for the RE estimates, the within R^2 is reported for the FE ones.

Table 4. Two specifications, gross income Gini indices (RE, FE, and GMM estimates)

	RE		FE		GMM	
	gini_gross_SWIID	*gini_gross_Texas*	*gini_gross_SWIID*	*gini_gross_Texas*	*gini_gross_SWIID*	*gini_gross_Texas*
$govt\_size_{t-2}$	0.17	-0.13**	0.099	-0.077	0.38	-0.44**
	(1.52)	(-2.20)	(0.29)	(-0.89)	(1.45)	(-2.18)
$public\_debt_{t-2}$	-0.02**	-0.04***	-0.02	-0.04***	-0.02	0.03**
	(-2.06)	(-7.13)	(-0.66)	(-2.96)	(-0.42)	(2.12)
$gdppc_{t-2}$	3.45	52.40***	16.00	44.00	-197.00**	-42.70
	(0.10)	(2.76)	(0.21)	(0.94)	(-1.99)	(-0.64)
$gdppc\_sq_{t-2}$	-0.62	-2.78***	-1.20	-2.30	9.09*	1.93
	(-0.37)	(-2.97)	(-0.31)	(-0.98)	(1.88)	(0.59)
$open_{t-2}$	0.02	0.02	0.04	0.02	-0.04	0.01
	(1.16)	(0.95)	(0.84)	(0.68)	(-1.12)	(0.47)
$educ_{t-2}$	0.32	-0.82	0.20	-0.90	5.29	2.15
	(0.27)	(-1.41)	(0.084)	(-1.35)	(1.10)	(0.60)
$liberties_{t-2}$	0.38	0.62***	0.46	0.59	0.61	0.06
	(1.03)	(2.77)	(0.61)	(1.39)	(0.37)	(0.06)
$infl_{t-2}$	-0.13**	-0.04*	-0.13	-0.05	-0.19	-0.11
	(-2.09)	(-1.73)	(-1.56)	(-1.32)	(-1.42)	(-1.41)
$unempl_{t-2}$	-0.12	0.06	-0.06	0.05	-0.64*	0.12
	(-1.51)	(1.21)	(-0.30)	(0.76)	(-1.65)	(1.03)
pop_gr_{t-2}	0.02	-0.05	0.29	-0.14	2.47	1.96*
	(0.38)	(-0.21)	(0.21)	(-0.50)	(1.16)	(1.84)
trend	0.39***	0.27***	0.33**	0.24**	0.54***	0.08
	(6.54)	(6.88)	(2.36)	(2.40)	(3.68)	(1.05)
Constant	60.70	-212.00**	-7.30	-177.00	1090.00**	270.00
	(0.35)	(-2.21)	(-0.019)	(-0.76)	(2.15)	(0.81)
Observations	633	429	633	429	633	429
R-squared	0.28	0.20	0.37	0.52		
Hansen J stat					1.00	1.00
AR(2) A-B test					0.08	0.64

Note: *t*-statistics in parenthesis based on robust standard errors (*z*-statistics for the RE estimates). ***, **, * denote significance at 1%, 5% and 10%, respectively. In the *gini_UN* specifications the observations where gross income is used are taken care of by adding a dummy (not reported). *p*-values are reported for both the Hansen J and the AR(2) statistics for the GMM estimates. $: the overall R^2 is reported for the RE estimates, the within R^2 is reported for the FE ones.

Table 5. Upper and bottom parts of the distribution (GMM estimates)

	top1_WTID	*top10_WTID*	*top1_AM*	*top10_earn_AM*	*poverty*
$govt\_size_{t-2}$	-0.26***	-0.53***	-0.21***	-0.60	-0.66***
	(-2.93)	(-2.75)	(-2.66)	(-0.67)	(-4.20)
$public\_debt_{t-2}$	0.01	0.05	0.02	-0.22**	0.02
	(0.36)	(1.03)	(1.04)	(-2.23)	(0.70)
$gdppc_{t-2}$	-67.90	-42.80	-133.00**	-126.00	8.99
	(-1.37)	(-0.44)	(-2.16)	(-0.42)	(0.13)
$gdppc\_sq_{t-2}$	3.46	1.98	6.73**	3.73	-0.73
	(1.41)	(0.41)	(2.17)	(0.27)	(-0.21)
$open_{t-2}$	-0.01	-0.04	-0.03	-0.47**	-0.03
	(-0.65)	(-1.27)	(-1.19)	(-2.28)	(-1.13)
$educ_{t-2}$	-4.15	-7.09	-3.12	-39.60*	-7.94**
	(-1.59)	(-1.41)	(-1.38)	(-1.94)	(-2.35)
$liberties_{t-2}$	-0.29	-0.08	-0.83	-2.62	-0.22
	(-0.45)	(-0.01)	(-1.47)	(-0.43)	(-0.30)
$infl_{t-2}$	0.013	-0.10	0.04	-1.14	0.03
	(0.18)	(-0.40)	(0.75)	(-1.48)	(0.33)
$unempl_{t-2}$	0.21**	0.25	0.23**	-0.21	0.00
	(2.23)	(1.22)	(2.22)	(-0.18)	(0.33)
pop_gr_{t-2}	0.55	2.65	0.89	9.79	-0.39
	(0.70)	(1.30)	(0.83)	(1.20)	(-0.43)
lt_rate_{t-2}	-0.06	-0.29	-0.10	-1.34***	
	(-0.93)	(-1.52)	(-1.28)	(-3.46)	
trend	0.08	0.14	0.08	1.67***	0.17***
	(1.46)	(1.15)	(1.39)	(3.19)	(2.62)
Constant	347.00	274.00	674.00**	1131.00	14.90
	(1.38)	(0.55)	(2.19)	(0.69)	(0.04)
Observations	419	387	392	337	243
Hansen J statistic	1.00	1.00	1.00	1.00	1.00
AR(2) A-B test	0.52	0.42	0.48	0.42	0.06

Note: *t*-statistics in parenthesis based on robust standard errors. ***, **, * denote significance at 1%, 5% and 10%, respectively. *p*-values are reported for both the Hansen J and the AR(2) statistics for the GMM estimates.

Table 6. Three specifications, net income Gini indices, with fiscal episodes dummies (GMM estimates)

	i) consolidation			ii) consolidation			i) expansion		
	gini_UN	*gini_SWIID*	*gini_AM*	*gini_UN*	*gini_SWIID*	*gini_AM*	*gini_UN*	*gini_SWIID*	*gini_AM*
$govt\_size_{t-2}$	-0.90***	-0.56***	-0.60***	-0.83***	-0.65***	-0.72***	-0.85***	-0.57***	-0.64***
	(-4.62)	(-6.07)	(-4.10)	(-4.62)	(-6.14)	(-4.72)	(-4.78)	(-4.23)	(-4.71)
$public\_debt_{t-2}$	0.08**	0.011	0.06	0.07**	0.02	0.07**	0.07**	0.02	0.07**
	(2.55)	(0.54)	(1.62)	(2.23)	(0.66)	(2.37)	(2.50)	(0.82)	(2.23)
$episode_{t-2}$	-0.68	1.00*	0.84	0.16	0.01	-0.41	2.29**	0.43	-0.11
	(-0.55)	(1.68)	(1.52)	(0.24)	(0.02)	(-0.71)	(2.13)	(0.70)	(-0.13)
$gdppc_{t-2}$	-240.00	77.91	-49.53	-424.00*	95.40	-336.00**	-329.00	146.00***	26.98
	(-1.06)	(1.23)	(-0.39)	(-1.71)	(0.89)	(-2.50)	(-1.44)	(2.72)	(0.24)
$gdppc\_sq_{t-2}$	12.18	-3.97	-2.45	21.05*	-4.78	16.77**	16.40	-7.41***	-1.37
	(1.08)	(-1.24)	(-0.39)	(1.71)	(-0.88)	(2.57)	(1.45)	(-2.78)	(-0.25)
$open_{t-2}$	-0.03	-0.02	-0.10**	-0.05**	-0.02	-0.06**	-0.03	-0.03*	-0.10**
	(-0.82)	(-1.35)	(-2.33)	(-2.03)	(-1.51)	(-2.38)	(-0.92)	(-1.91)	(-2.46)
$educ_{t-2}$	-9.75**	-5.79**	-14.17***	-6.47	-3.95	-15.40***	-8.55**	-2.08	-13.9***
	(-2.02)	(-2.55)	(-5.58)	(-1.54)	(-1.62)	(-3.87)	(-2.11)	(-0.97)	(-4.96)
$liberties_{t-2}$	-0.19	0.66	-0.34	-0.27	-0.24	-0.42	-0.43	-0.20	-0.73
	(-0.15)	(1.23)	(-0.33)	(-0.30)	(-0.38)	(-0.42)	(-0.43)	(-0.30)	(-0.71)
$infl_{t-2}$	-0.04	0.07	0.14	-0.19	0.15	-0.02	0.01	0.15	0.12
	(-0.23)	(0.56)	(0.98)	(-0.87)	(1.20)	(-0.18)	(0.07)	(1.30)	(0.96)
$unempl_{t-2}$	0.24	0.22	0.20	0.08	0.16	0.20	0.28	0.08	0.17
	(0.80)	(1.39)	(0.99)	(0.32)	(0.99)	(1.14)	(1.28)	(0.63)	(0.99)
pop_gr_{t-2}	-1.12	1.88*	2.43**	-0.64	1.99**	0.52	-0.87	2.73**	2.51**
	(-0.66)	(1.93)	(2.31)	(-0.40)	(2.41)	(0.55)	(-0.63)	(2.47)	(2.02)
trend	0.02	0.19***	0.26***	0.06	0.21**	0.05	0.09	0.28***	0.27***
	(0.13)	(2.89)	(2.83)	(0.40)	(2.35)	(0.57)	(0.60)	(5.38)	(2.75)
Constant	1235.00	-345.00	-203.00	2182.00*	-438.00	1737.00**	1691.00	-681.00*	-85.30
	(1.08)	(-1.11)	(-0.31)	(1.76)	(-0.82)	(2.53)	(1.47)	(-2.56)	(-0.15)
Observations	278	633	312	234	496	255	278	633	312
Hansen J statistic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AR(2) A-B test	0.24	0.73	0.54	0.30	0.74	0.46	0.26	0.78	0.70

Note: *z*-statistics in parenthesis based on robust standard errors. ***, **, * denote significance at 1%, 5% and 10%, respectively. In the *gini_UN* specifications the observations where gross income is used are taken care of by adding a dummy (not reported). *p*-values are reported for both the Hansen J and the AR(2) statistics for the GMM estimates.

Table 7. Upper and bottom parts of the distribution, with fiscal episodes dummies (GMM estimates)

	i) consolidation				
	top1_WTID	top10_WTID	top1_AM	top10_AM	poverty
$govt\_size_{t-2}$	-0.28***	-0.58***	-0.19*	-0.03	-0.60***
	(-3.17)	(-3.01)	(-1.95)	(-0.06)	(-4.80)
$public\_debt_{t-2}$	0.00	0.04	0.01	-0.26**	0.02
	(0.23)	(0.77)	(0.37)	(-2.55)	(0.83)
$episode_{t-2}$	0.59*	-0.59	0.33	-3.02	0.72
	(1.71)	(-0.79)	(1.45)	(-1.24)	(1.56)
Observations	419	387	392	337	243
Hansen J statistic	1.00	1.00	1.00	1.00	1.00
AR(2) A-B test	0.88	0.29	0.47	0.69	0.08
	ii) consolidation				
	top1_WTID	top10_WTID	top1_AM	top10_AM	poverty
$govt\_size_{t-2}$	-0.23***	-0.48***	-0.15*	-0.13	-0.70***
	(-3.12)	(-2.98)	(-1.76)	(-0.18)	(-4.88)
$public\_debt_{t-2}$	0.00	0.034	0.015	-0.28***	0.019
	(0.11)	(0.81)	(0.88)	(-2.95)	(0.69)
$episode_{t-2}$	0.42	2.48***	-0.18	5.77*	-0.10
	(0.99)	(3.13)	(-0.61)	(1.81)	(-0.11)
Observations	419	387	392	337	243
Hansen J statistic	1.00	1.00	1.00	1.00	1.00
AR(2) A-B test	0.51	0.06	0.75	0.99	0.10
	i) expansion				
	top1_WTID	top10_WTID	top1_AM	top10_AM	poverty
$govt\_size_{t-2}$	-0.37***	-0.69***	-0.22***	-0.16	-0.74***
	(-4.24)	(-3.54)	(-2.14)	(-0.13)	(-8.67)
$public\_debt_{t-2}$	-0.00	0.02	0.00	-0.26***	0.03
	(-0.26)	(0.43)	(0.14)	(-2.75)	(0.95)
$episode_{t-2}$	0.69**	0.98*	0.80**	7.83***	-1.06*
	(2.36)	(1.83)	(2.53)	(3.61)	(-1.73)
Observations	333	307	294	275	205
Hansen J statistic	1.00	1.00	1.00	1.00	1.00
AR(2) A-B test	0.29	0.54	0.17	0.88	0.45

Note: *z*-statistics in parenthesis based on robust standard errors. ***, **, * denote significance at 1%, 5% and 10%, respectively. *p*-values are reported for both the Hansen J and the AR(2) statistics for the GMM estimates. Only the coefficients of the fiscal variables are reported for the sake of brevity (full results available upon request).

Data Appendix: variables, description and sources

Gini index (***inequality***). We use three measures based on net income (*sources*: UN-WIDER, SWIID, AM 2011) and two based on gross income (*sources*: SWIID, Texas Inequality Database).

Top income shares (***inequality***). We use two measures taken from the WTID (top 1% and top 10% income shares), then the top 1% income share (*source*: AM 2011) and the top 10% earnings share (*source*: AM 2011). The latter is constructed as the ratio of earnings at the top decile to the median earnings (a figure of 180 means that those in the top 10% of earnings receive 80% or more in excess of median earnings).

Poverty (***inequality***). We use the series indicating the % of the population living below 60% of the median equivalised disposable income (*source*: AM 2011).

Government size (***govt_size***). General government final consumption expenditure divided by GDP. *Source*: WDI.

Public debt **(*public_debt*)**. Public debt divided by GDP. *Source*: IMF Historical debt database.

Fiscal expansion and consolidation episodes (***episode***). We identify the expansion and consolidation periods following the strategy of Nickel et al. (2010), as explained in Section 4.3 of the text (i). As an alternative identification strategy of the latter, we also use IMF data as explained in the text (ii).

Openness **(*open*)**. Imports plus exports divided by GDP. *Source*: PWT.

Education (***educ***). Secondary school enrolment per capita. *Source*: CNTS, Banks 2011.

Civil liberties (***liberties***). An index measuring freedom of expression, assembly, association, and religion. 1 represents the most free (established and equitable rule of law with free economic activity; citizens enjoy a full range of civil liberties), and 7 represents the least free (6 is the highest value in our sample: it represents countries with partial rights, a few social and religious freedoms, and some restricted business activity). *Source*: Freedom House.

Inflation **(*infl*)**. Annual inflation rate calculated from the CPI. *Source*: MEI-OECD.

Unemployment (***unempl***). Unemployment rate calculated as unemployed people divided by the labour force. *Source*: OECD.

Population growth **(*pop_gr*)**. Annual growth rate of population. *Source*: PWT.

Long-term interest rate **(*lt_rate*)**. Nominal long-term interest rate. *Source*: AMECO and OECD.