The Effects of Fiscal Redistribution

Michele Battisti
University of Palermo, LUISS and RCEA[*]

Joseph Zeira
Hebrew University of Jerusalem, LUISS, CEPR and RCEA[♣]

October 2014[♠]

Abstract

This paper examines empirically the role of fiscal policy in redistribution of market incomes to disposable incomes. We show that fiscal policy has a strong and significant effect on income inequality. An increase of public expenditures by one percent of GDP reduces the Gini coefficient of disposable income by 0.4 percentage point. This is a very significant effect. The paper also tests and rejects the possibility of reverse causality, namely that income distribution affects fiscal policy. The paper also examines the effect of fiscal policy on the rate of poverty and finds that it is significant and the effect is largest for expenditures on support in the labor market, which target the poor.

JEL Specification: D31, D63, C21

Keywords: public policy, income distribution, redistribution, income inequality

---

[*] E-mail: michele.battisti@unipa.it.

[♣] E-mail: joseph.zeira@mail.huji.ac.il.

[♠] We are grateful to Kaushik Basu, who supported our work on this paper throughout the whole process. The comments of James Foster helped us significantly. Sharon Hadad first introduced us to the correlation between public expenditure and inequality, which spurred our interest in the topic. We received excellent comments from Paola Giuliano, Giuseppe Ragusa, Domenico Giannone and many more. Remaining errors are of course all us.

The Effect of Fiscal Redistribution on Inequality

1. Introduction

Every discussion on income distribution and inequality distinguishes between market income, namely income before tax and without transfers, and disposable, or net income, which is after tax and including transfers. Hence, taxation and transfers create a redistribution of income. This redistribution is usually progressive, as direct taxes and subsidies are progressive, and thus it is supposed to reduce inequality, in the transition from market income to disposable income. This paper focuses on measuring the effect of fiscal policy in income redistribution and in reducing inequality. It also examines which type of fiscal policy is most strongly related to the redistribution of income, are they transfer payments? Is it direct taxation? Or is it the overall measure of fiscal policy, namely public expenditures, which are also known as the size of the public sector?

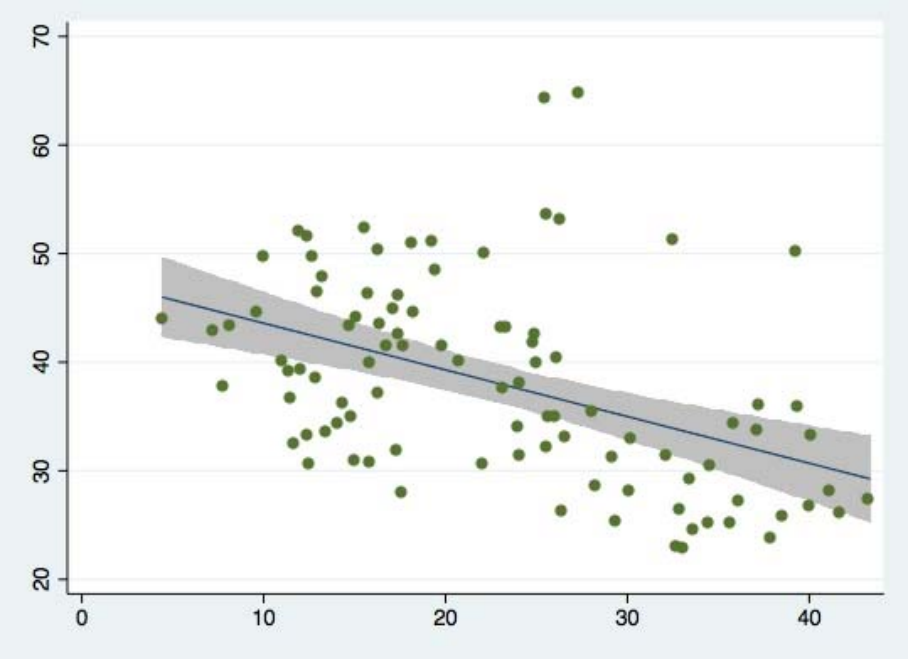

Figure 1: Gini of Disposable Income and Percent of Public Expenditures in GDP across 83 Countries in 2005[1]

[1] Inequality data are from Solt (2009) and public expenditures data are from IMF (2014b).

Figure 1 presents a simple scatter-diagram of two variables, the size of the public sector and inequality. The horizontal axis measures the share of public expenditures relative to GDP and the vertical axis measures the Gini coefficient of disposable income. There are 83 countries in the sample for the year 2005. Actually, to avoid cyclical variability, we use 5 years averages for each variable, namely the variables in Figure 1 are averages over the years 2001-2005 for both public expenditures and for the Gini coefficients. Figure 1 clearly shows that there is a strong negative correlation between these two variables. It means that countries with a larger public sector tend to have lower inequality of disposable income, and vice versa.[2] This observation is our point of departure to a broader empirical investigation. We examine the separate effects on inequality before and after taxes and subsidies, we control for other variables and we test for reverse causality.

In our research we use cross-country regression analysis to estimate the effect of public spending on inequality of disposable income, as measured by the Gini coefficient. In these regressions we control for the Gini coefficient of market income, so that our analysis enables us to measure the specific role of public expenditures in fiscal redistribution. We find that this fiscal variable, public expenditures, captures most of the redistribution done by fiscal policy. We can also quantify its effect and get that every additional percent of GDP to public expenditures reduces the Gini coefficient by 0.4 percentage points. This is a significant effect. We also examine the effect of partial elements of fiscal policy on redistribution, where the main ones are direct taxation and transfers. We find that direct taxation has a comparable effect to fiscal expenditures in reducing inequality and we also find that transfers or subsidies do not have a significant effect on the overall inequality. These results are from a cross country analysis, but they are reached also when we pool our regressions over time.

We then turn to examine the possibility of reverse causality, namely that fiscal policy is affected by inequality instead of affecting it. Actually this is a central claim in the literature on political economy, which has been raised initially by Meltzer and Richard (1981). They have claimed that if inequality is high, there is more public

[2] The regression coefficient of the Gini over public expenditures is -.35 and is significant at 1%. It means that if public expenditures rise by 1 percent of GDP, Gini of disposable incomes declines by 0.35 points.

pressure for redistribution and hence the size of the public sector increases. In order to test for this possibility we run a two stage regression. In the first stage we test how inequality of market incomes affects fiscal policy, controlling for other variables which should affect fiscal policy as well. We then use the resulting estimates of fiscal policy and test how it affects inequality of disposable income. The results confirm our previous results that causality goes from fiscal policy to disposable income inequality. Actually, our results indicate that the inequality of market incomes has a negative effect on fiscal policy, namely the Meltzer and Richard hypothesis does not pass the empirical test.

Finally, we do not only look at one measure of inequality, namely the Gini coefficient, but we also examine the effect of fiscal redistribution also on the rate of poverty. We find that this rate is also affected by total public expenditures, namely on the overall fiscal policy, but that it is especially affected by transfers. This is not surprising, since these expenditures are specifically directed toward the poor and should therefore affect their status significantly. Indeed, our cross country tests show that this effect of transfers on the rate of poverty is quite large.

This paper is related to a few lines of research. The main one is the empirical research on the determinants of inequality. Since data on inequality does not back too long in time and since data on income distribution is not of high quality for many countries, this literature is not very wide. Barro (2000) is an early example of such a study, which also contains a thorough survey of the previous literature. Barro (2000) focuses mainly on the state of development and its effect on inequality, namely on the Kuznets hypothesis, that inequality increases at the early stages of development and then declines at the later more advanced stages. Barro does not explicitly discuss policy variables in his analysis, while this paper focuses on such variables and especially on fiscal policy. Another important survey of this area of research is Atkinson (1997). Recently there are a number of papers that study the redistribution of income by fiscal policy, from market incomes to disposable incomes, such as Chu, Davoodi and Gupta (2004), IMF (2014a), Niehues (2010), Ospina (2010), Martinez-Vazquez, Vulovic and Moreno-Dodson (2012), Muinello-Gallo and Roca-Sagles (2013) and Woo et al (2013). Most closely to our paper are IMF (2014) and Muinelo-Gallo and Roca-Sagalés (2013) (2013), which examine the relationship between redistribution, fiscal policy and

economic growth. Our paper differs from most of these papers in three main ways. First, we do not measure redistribution by the simple difference between the Gini of disposable income and the Gini of market income, but we rather regress Gini of net income over Gini of market income to get a better estimate to its effect than 1. The second deviation of our paper from these papers is our dealing with the possibility of reverse causality.[3] Third, we measure the effect of fiscal redistribution not only on the overall Gini coefficient but also on income distribution at the bottom, namely on the rate of poverty.

The paper is structured as follows. Section 2 presents the data and the variables used while Section 3 presents the empirical model. Section 4 presents cross country analysis of the effect of redistribution, while Section 5 extends the analysis for more periods of time. Section 6 examines the possibility of reverse causality. Section 7 tests the effect of fiscal redistribution on the rate of poverty and Section 8 summarizes.

2. Variables and Data

The main variables used in the paper are the measures of inequality and of fiscal policy. Inequality is measured mainly by the Gini coefficient. We use Solt (2009) standardized version of the WIID 2008 (UNU_WIDER, 2008), for the two variables of Gini_of disposable income and Gini of market income. The Gini of disposable income, or net income, in country j in year t is denoted by GN(j, t), while the Gini of market income in country j in year t is denoted by GM(j, t). In most of our regressions we use averages of the variable over the last five years. Hence, the average variable for period t is defined and denoted in the following way:

(1) $GN_5(j, t) = [GN(j, t-4) + GN(j, t-3) + GN(j, t-2) + GN(j, t-1) + GN(j,t)]/5.$

In some regressions we use a measure of the rate of poverty. Since the definition of the rate of poverty differs across countries, we use the uniform measure of poverty rate by the OECD, which limits us to OECD countries only. The data used is more recent, up to 2010, and it includes the poverty rate after taxation, namely for disposable income, and the before taxation poverty rate, namely the poverty rate for market income. The two poverty rates are denoted by POVN(j, t) and POVM(j, t), respectively.

[3] Muinelo-Galo and Roca-Sagales (2013) also treat fiscal policy as endogenous, but they do it in a system of 3 equations, of growth, inequality and fiscal policy, and they do not use our two stage approach.

For fiscal policy we use a number of measures. The most common measure is public expenditures relative to GDP. We therefore denote by E(j, t) the percentage of expenditures of the public sector in GDP. The moving average over 5 years of this variable is denoted as in equation (1) by $E_5(j, t)$. The data on fiscal policy in general are taken from the GFS (Government Finance Statistics, total expenditure percent of GDP for total budget Government, supplied from IMF (2014)). We use mainly cash measures and divide them by GDP (non-cash measures are available for a few countries from 2001 onwards and we use them when cash measures are missing). For the regressions on the rate of poverty, where we restrict the analysis to OECD countries, we use the data on fiscal policy from the OECD data base. In addition to total public expenditures we use in our analysis some additional variables of fiscal policy. One such variable is expenditures without defense costs, which we examine as well, since defense costs might have a lower effect on redistribution. Since this subtraction of defense costs does not have a significant effect on the results, we use overall public expenditures thereafter. Public expenditures net of defense are denoted by EMD(j, t). We also test directly the effects of the main tools of redistribution, namely direct taxes, and some of the social transfers. Direct taxes are denoted DT(j, t). Another variable we use in the general regressions is social benefits, SB(j, t), which counts mainly for unemployment insurance payments, all in percents of GDP.[4] Our analysis of the rate of poverty using OECD data, enables us to consider a much finer array of social transfers. We use pension spending, denoted P(j, t), spending on income allowances I(j, t), and other labor market interventions L(j, t). All are in percentages of GDP. We also control for the overall social spending in the OECD countries, which includes these transfers plus spending on health and housing.

In addition to the variables that measure inequality and fiscal policy, we use more variables to control for various effects on fiscal policy, where we confront the possibility of reverse causality. One such variable is the state of development of the country. We measure it simply by calculating the ratio of output per capita in country j at time t to output per capita in the US at time t and we denote this ratio D(j, t).[5] The levels of Output per capita for all countries are PPP adjusted and are taken from the WPT data set

[4] Data on social benefits, taxes and defense as shares of GDP are all from IMF (2014).

[5] We also tried an alternative measure for development, the share of agriculture in GDP, which yields similar results. We do not use it since it is available for fewer countries.

(Feenstra et al, 2013). Another variable, taken from the same database, which is use to control for openness, is the share of exports and imports in GDP, and it is denoted OPEN(j, t). Other variables used are ethnic fractionalization, as collected by Alesina et al. (2003), and age dependency ratio, namely the ratio of very young and old to the working age population in ages 15-64 (World Bank, 2014). These variables are denoted by FRAC(j, t) and DEP(j, t) respectively.

3. The Effect of Fiscal Policy on Redistribution: The Model

In order to examine how fiscal policy affects redistribution we treat both the distribution of market incomes and the fiscal policy as given and our dependent variable is the distribution of disposable income. This is the result of the interaction of the original distribution of market incomes and of fiscal policy, which changes income through taxes and transfers. Hence, our basic regression model is:

$$GN(j, t) = a + b\, GM(j, t) + c\, E(j, t) + v(j, t), \tag{2}$$

where a is the constant and v(j, t) is a random variable. Note, that the distribution of market incomes is assumed to be given in equation (2). This is of course only a simplifying assumption and this distribution is affected by many variables, among them even by fiscal policy, through expenditures in education mainly. This is a valid point but it will be taken care of in another research, which we intend to pursue in the near future. The assumption that fiscal policy is also given is dealt with in Section 5, which examines the possibility of reverse causality.

In the estimation of equation (2) we expect to estimate a positive value of b, actually close to 1, and a negative value of c. The reasons are that inequality of disposable incomes should reflect the basic inequality of market incomes, but it should be reduced by the public sector, mainly by direct taxation and by subsidies. Our main assumption in equation (2) is that we can use the size of the public sector E as a proxy for these two policy variables. Clearly the size of public expenditures should be strongly related to the size of direct taxes. We also assume, that governments that spend more on poverty alleviation and on social benefits, tend to spend more in general.

Note that both inequality and fiscal policy tend to fluctuate over time, mainly due to fluctuations of output and income over the business cycle. As a result we resort to use five years' averages in our estimation. Hence the basic regression model is actually:

(3) $$GN_5(j, t) = a + b\, GM_5(j, t) + c\, E_5(j, t) + u(j, t).$$

Note that u(j, t) is actually equal to $u_5(j, t)$. Another model that we examine in addition to (3) is where the Gini of market incomes affects the distribution of disposable incomes with a lag. It is not clear theoretically why that should be the case, except that it might account for gradual adjustment of the distribution of income. Anyway, our empirical tests show that this is indeed a better choice in most regressions. We therefore present a third model:

(4) $$GN_5(j, t) = a + b\, GM_5(j, t-5) + c\, E_5(j, t) + u(j, t).$$

Equation (4) uses a lag of 5 years in order to avoid overlap of values in the regression.

Hence, equations (3) and (4) will be our main empirical models of redistribution. We will estimate them and some versions of these equations, mainly using direct taxation and transfers instead of total public expenditures.

4. Cross-Section Regressions

Our first estimations of the model are cross-country regressions for the year 2005. Table 1 presents the results of these estimations of the regression models (3) and (4). The first regression in Table 1 is just the basic model from equation (3). This regression supports the model very strongly. Inequality of disposable income is strongly affected by inequality of market income, but it is changed significantly by public policy. Each percent of GDP added to public expenditures reduces the Gini coefficient of disposable income by 0.4 percentage points. If we remember that public expenditures in the developed OECD countries vary between 35 and 55 percent of GDP, then this variability itself can explain a variation of 8 points in the Gini coefficient. If we put aside the three less developed countries, Mexico, Chile and Turkey, the Gini coefficient in the OECD countries varies between 24 percent and 38 percent. Namely, it varies over a range of 14 percentage points. Fiscal policy therefore accounts for the variation of 8 percentage points, namely it explains more than half of the variability of the Gini coefficient in these countries. This is a very significant effect.

Dependent Variable: $GN_5(2005)$					
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$GM_5(2005)$	0.816*** (0.09)				
$GM_5(2000)$		0.935*** (0.09)	0.961*** (0.11)	0.959*** (0.09)	0.993*** (0.20)
$E_5(2005)$	-0.406*** (0.09)	-0.423*** (0.07)			
$EMD_5(2005)$			-0.439*** (0.08)		
$DT_5(2005)$				-.493*** (0.19)	-0.671*** (0.19)
$SB_5(2005)$					-1.188 (1.40)
CONST.	12.638*** (4.97)	7.583* (4.43)	5.902 (4.88)	-2.219 (4.03)	-3.460 (9.64)
Prob>F	0.0000	0.0000	0.0000	0.000	0.000
R-Squared	0.505	0.648	0.667	0.534	0.526
Number of Countries	83	80	60	102	51

1. Significance levels of 1% are denoted by ***, of 5% by **, and of 10% by *.
2. Robust standard errors are in the parenthesis.

Table 1: Gini of Disposable Incomes and Public Expenditures across Countries, 2005

In the second regression in Table 1 we run the version of the model in equation (4), where we lag the Gini of market income by 5 years. The results of this regression are similar to the results of the first regression, except that the R^2 is much higher, namely that this change increases the explanatory power of the regression. As a result we next consider this as our basic specification. The third regression replaces public expenditures with public expenditures minus defense, which reduces the number of countries from 80 to 60, as data on defense are not available for many countries. Since the results are almost the same as in the second regression, we keep using overall expenditures in the rest of the analysis without subtracting defense costs.

The fourth and fifth regressions in Table 1 examine the use the size of public expenditures as a proxy for the main redistribution tools, namely for direct taxation and transfer payments. In these regressions we simply use these variables or similar ones instead of total public expenditures. We find that both variables have a negative effect on inequality, namely that they redistribute income. But the effect of direct taxation is

significant, while the effect of social benefits is statistically insignificant. Furthermore, adding social benefits to direct taxation reduces R^2, namely the explanatory power of the regression is reduced. This is not surprising since the variable we use is a small part of transfers, namely unemployment benefits. We therefore conclude that the redistributive effect can be assessed much better by use of progressive direct taxation than by social benefits and social subsidies. Below we find that this result is reversed when we focus on the rate of poverty. Note that the absolute effect of direct taxation has a stronger effect on inequality than total expenditures, but this result is not surprising. Any marginal unit of public spending is only partially financed by direct taxes, while the rest is financed by indirect taxes. Hence direct taxes fluctuate by less than public spending, so their measured effect on inequality should be higher. Overall, regressions (4) and (5) have lower R^2, so their explanatory power is lower than that of total public spending. From here on, public spending will be our main measure of the redistribution of income from market to disposable incomes. As a result regression model (4) remains our central and basic regression model.

Note, that since the coefficient b is close to 1, we can deduce from equation (4) that the decline from market Gini to disposable Gini is explained mainly by total public expenditures as a share of GDP. This is therefore a variable that captures many details of fiscal policy. This result is further strengthened below, where we estimate equation (4) over many periods of time.

5. Adding More Periods of Time

The results of Section 4 are derived from a cross-section regression of countries in the year 2005. Since our data span a much longer time, we wish to use the full period in order to improve the estimation results. We run both a pooled regression and a panel regression over all data with country's fixed effects. It is important to stress that we expect the pooled regression to give us better results than the panel regression. The reason is that countries usually differ with respect to their preferences toward redistribution of income. Hence, countries differ in their fiscal policies due to these different preferences. These differences do not disappear over time. As a result, adding countries' fixed effects to the regression might capture these differences, and as a result it will reduce our ability to

identify the effect of fiscal policy in reducing inequality. Note also that both the pooled and the panel regressions run in intervals of 5 years, as we use averages of 5 years. Table 2 presents the results of these regressions. The first regression is the pooled and the second is the panel regression.

Regression	**Pooled**	**Panel**
Dependent Variable	$GN_5(t)$	$GN_5(t)$
$GM_5(t-5)$	0.803***	0.208***
	(0.05)	(0.03)
$E_5(t)$	-0.302***	-0.073***
	(0.04)	(0.03)
Const.	10.542***	28.923***
	(2.80)	(1.85)
Prob > F	0.000	0.000
R-squared	0.610	0.574
No. of observations	306	337

Table 2: Pooled and Panel Regressions of Gini over Public Expenditures

The results of the pooled regressions in Table 3 are illuminating. The pooled regression presents similar results to the cross-section estimation of the basic model, except that the coefficients are a bit smaller. Both the Gini of market income and public expenditures have a slightly smaller effect on Gini of disposable income, but the effects are in the same direction and the results are very significant. The high R-squared of this regression shows that public spending is a variable that captures most of the redistribution achieved by the fiscal policy. To see this heuristically, note that the standard deviation of Gini of disposable income is 9.8. The standard deviation of Gini of market income (with a lag) is 8. Hence, the lagged Gini of market income accounts for 6.4 of the variation of the Gini of disposable income and leaves a variation of 3.4 unexplained. The standard deviation of public spending is 10.6, so that it explains about

3.2 of the variability of Gini of disposable income, namely it explains almost all the remaining unexplained variability.[6]

Note that although the pooled regression uses more observations, they might not be clearly better than the cross-country regressions in Section 4. The reason is that the quality of the data on income distribution is improving over time. As a result the average quality of the data in the regression in the year 2005 is higher than the quality of data in the regressions in Table 2, which contains also previous periods with lower quality of data. This point must be taken into consideration in consideration of the different results.

Note that the panel regression yields similar results in direction to the pooled regression, but they are much smaller in size. The reason for that is that much of the differences between fiscal policies in the panel are differences between countries with respect to their social preferences.[7] As a result these are captured by the panel country fixed effects and they reduce the ability of the regression to identify the effect of fiscal policy on redistribution. For this reason we use for the rest of the analysis pooled regressions instead of panel regressions.

6. A Test of Reverse Causality

A famous paper by Meltzer and Richard (1981) claims, that the rise of public spending in the 20th century was driven mainly by public pressure to redistribute income. They conclude that public spending should depend positively on inequality, since higher inequality raises public pressure for redistribution and that increases public spending. Thus, such a mechanism should be taken into consideration in our measurement of the effect of public spending on inequality to avoid endogeneity and reverse causality. In this section we account for this possibility and show that the effect of public policy on inequality is still negative and significant, and the causality clearly goes from fiscal policy to inequality of disposable income. This is done by use of the method of 2SLS, Two Stages Least Squares regression.

[6] We also tested in the pooled regression the use of the lagged value of the Gini of market income. Using instead the contemporaneous Gini of market income the results are very similar to Table 2. The coefficient of contemporaneous Gini is 0.839, the coefficient of public spending is -0.35 and the R-squared is 0.57.
[7] This is also shown below in the first stage regression in Section 6.

In the first stage of estimation, we run a regression of the size of the public sector, namely public expenditure relative to GDP, on a number of exogenous variables. The first one is inequality of market incomes, according to the claim of Meltzer and Richard (1981, 1983). Clearly, the variable that should trigger fiscal policy, according to their model, is inequality of market incomes and not of disposable incomes, which is already the result of fiscal policy. In addition to Gini of market income, we control for more variables that might affect fiscal policy. The first is the level of development of the country. Poor countries are supposed to spend a smaller share of income on public services, as they are considered to be a superior good. An interesting hypothesis on the size of the public sector appears in Rodrik (1998), who claims that openness should increase the public sector, since openness exposes a country to higher risk and governments try to reduce risks. We therefore add openness as another variable to our first stage estimation. Two population variables are also added. Ethnic fractionalization, FRAC, should affect the preferences of the public toward redistribution. The second variable is demographic, the dependency rate, DEP, which measures the ratio between children and old age population to the working age population. Since both children and old age are in greater need of redistributing policies, either through education or old-age support, this ratio should also have a positive effect on public expenditures.[8] An additional variable that could have an effect on fiscal policy is a time dummy of 0 before 1995 and 1 from 1995 on. This variable is supposed to capture the possibility that the collapse of the Soviet Union, after 1990, had a negative effect on public spending in many countries. Whether because this event was viewed as a final victory of the capitalist system, or because it reduced fear of communism, but many view this event as an important trigger to a reduction of the welfare state in many countries.

Table 3 presents the results of the 2SLS analysis of the effect of public expenditures on Gini of disposable income. The analysis is performed both in pooled regressions and in panel regressions with between estimator, namely on country means. Each analysis is described by two regressions, the first and the second stage. Regressions

[8] Interestingly Muinelo-Gallo and Roca-Sagalés (2013) use very similar variables in their estimation of fiscal policy. They do not use fractionalization, but use political system data instead. Another difference is that we use only aggregate fiscal expenditures as the dependent variable, while they use various parts of fiscal policy instead. The main difference between our estimation and theirs is that we use the results of this regression for testing reverse causality, which is not done by Muinelo-Gallo and Roca-Sagalés (2013).

(1) and (2) are pooled, and (3) and (4) are between. All variables are 5 years' averages, except for fractionalization and dependency rate, which are stable over time.

Regression	**(1)**	**(2)**	**(3)**	**(4)**
Dependent Variable	$E_5(t) - 1^{st}$ stage	$GN_5(t) - 2^{nd}$ stage	$E_5(t) - 1^{st}$ stage	$GN_5(t) - 2^{nd}$ stage
$GM_5(t-5)$	-0.196***	0.737***	-0.208*	0.856***
	(0.07)	(0.05)	(0.12)	(0.09)
$D_5(t)$	4.767***		4.970***	
	(0.70)		(1.16)	
$OPEN_5(t)$	-25.325***		-27.904***	
	(3.89)		(6.28)	
FRAC	-9.817***		-5.823	
	(2.54)		(4.12)	
DEP	0.166***		0.134*	
	(0.06)		(0.09)	
D1995	-0.245			
	(1.04)			
2SLS $E_5(t)$		-.603***		-0.556***
		(0.07)		(0.12)
Const.	37.335***	22.475***	37.809***	15.603***
	(3.55)	(3.41)	(5.73)	(5.52)
Prob > F	0.000		0.000	
Prob > χ^2		0.000		0.000
R-squared	0.315	0.496		
R-squared between			0.352	0.561
No. of observations	304	304	334	334
No. of groups			90	90

Table 3: 2SLS Regression of Gini over Public Expenditures

The findings of Table 3 are very interesting. The results of the first stage are partly according to expectations, but partly surprising. First of all, the Gini of market incomes affects public spending negatively, which contradicts the theoretical claim of Meltzer and Richard (1981). Namely, higher inequality of market incomes is correlated with less and not with more redistributive policies.[9] Second, openness affects public spending negatively, and that is in contradiction to the findings of Rodrik (1998). The other variables in the first stage regression affect public expenditures as expected. The level of development increases the share of public expenditures in GDP, reaffirming that public services can be viewed as a luxury good. The two population variables, ethnic fractionalization and age dependency ratio, also affect public spending as expected. Ethnic fractionalization reduces redistribution policies, since people in the country feel less solidarity, while a larger share of old and young increases social expenditures. The time dummy variable of 1995 does not have a significant effect on public spending.

The second stage regressions strongly reaffirm our previous results. The effect of the market Gini on disposable Gini in both pooled and between regressions is close to the effect in the pooled regression in Table 2. Most importantly, the implied public spending, which is derived from the first stage regression, reduces inequality significantly in both regressions (2) and (4). Its effect is larger in size than in Tables 1 and 2, but since this is only the effect of the explained part of the variable E, it should be double in size, as it is indeed.

7. Redistributive Fiscal Policy and the Rate of Poverty

In this section we examine the effect of redistributive fiscal policies not on general inequality, but rather on the lower domain of the distribution, namely on the rate of poverty. This is the share in population which is defined as poor. It is hard to get comparable data on poverty rates across all countries, because they differ significantly in their definition of poverty. We therefore focus in this subsection on the OECD countries, since the organization uses a uniform definition of poverty in their statistics. The rate of poverty is defined as the share of people with household income that is lower than half of

[9] Interestingly this result is reached also in Muinelo-Gallo and Roca-Sagalés (2013).

the median income. The OECD countries differ significantly in their rates of poverty, from close to 5% in the Czech Republic and in Denmark, to more than 20% in Mexico and in Israel. We use this uniform data on poverty in a cross section test in 2010 and also in pooled regressions that use also previous periods.

The dependent variable in all regressions is the rate of poverty of disposable incomes. The explanatory variables are the rate of poverty of market incomes and various variables that reflect fiscal policy. To keep consistency of data we use fiscal policy data from OECD and not from GFS, as done in previous sections. The first fiscal variable is the total public expenditures as percent of GDP, E(j, t). A second variable is the sum of public social expenditures, which comprises of pensions, income support subsidies, unemployment benefits, health expenditures by the public sector and housing. This variable is denoted SOC(j, t) for country j in year t. A third variable is public pensions, denoted PEN(j, t), which should affect poverty significantly since they increase income of the old, which are usually much poorer than the rest of the population. A fourth variable is income support to working and non working people. This variable is denoted SUP(j, t). All variables are in percentage of GDP. We first present the results of the cross-section regression in Table 4 below and then of the pooled regressions. All data for the regressions in this section are taken from the data base of OECD.

Dependent Variable: $POVN_5$(2010)					
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$POVM_5$(2010)	0.226* (0.14)	0.218* (0.14)			0.208* (0.13)
E_5(2010)	-0.316*** (0.12)		-0.081 (0.15)	-0.081 (0.15)	
SOC_5(2010)		-0.495*** (0.14)			
PEN_5(2010)				0.005 (0.237)	-0.257 (0.20)
SUP_5(2010)			-1.365*** (0.43)	-1.361*** (0.47)	-1.692*** (0.36)
CONST.	18.301*** (5.26)	14.682*** (3.48)	19.691*** (4.35)	19.718*** (4.62)	13.948*** (3.11)
Prob>F	0.0455	0.0053	0.0006	0.0023	0.0008
R-Squared	0.227	0.312	0.433	0.433	0.456
Number of Countries	27	31	29	29	31

1. Significance levels of 1% are denoted by ***, of 5% by **, and of 10% by *.

2. Robust standard errors are in the parenthesis.

Table 4: Cross-Section Tests of the Rate of Poverty on Fiscal Policy in OECD Countries

Table 4 presents the results of 5 cross-country regressions. The number of countries is around 30, but it differs from one regression to the other due to data limitations. Regression (1) is the basic regression of the rate of poverty in disposable incomes on the rate of poverty in market income and on total public expenditures. There are two interesting results in this regression. The first is that the relation between the rate of poverty of disposable income and of market income is weak and hardly significant. This stands in contrast with the results in Sections 4 and 5 that show that the relation between Gini disposable and Gini market is very significant and much larger, close to 1. The reason is that the redistribution of income by fiscal policy affects mainly people with low incomes and succeeds in reducing the rate of poverty significantly. This is done mainly by the social transfers that target mainly poor populations. Regression (1) in Table 4 also shows that public expenditures reduce significantly the rate of poverty. Every additional percent of GDP that goes to the public sector reduces the rate of poverty by 0.32 percent. The next regressions examine the effects of partial public expenditures that are more directed to poverty alleviation.

Regression (2) replaces the total public expenditures by social expenditures, SOC, which is defined above. Note that in the OECD countries this is a large part of public expenditures (40% to 50% of total expenditures), but it is clearly more focused on the poorer parts of the population. We should therefore expect it to have a much stronger effect on the rate of poverty. Indeed this regression supports this hypothesis. Every percent of GDP that goes to social public expenditures reduces the rate of poverty by half percentage point. Regression (3) examines the effect of a more specific expenditures and that is income support subsidies. It shows that once this expenditure is added total expenditures become insignificant and the effect of income support is much stronger. Every percent of GDP that goes to income support subsidies reduces the rate of poverty by 1.4 percentage points, more than 3 times the effect of all public expenditures. In regression (4) we add the variable of expenditures on pensions and it does not change the results of regression (3) at all. Pensions themselves have no effect on the rate of poverty,

unlike our preliminary conjecture. Their effect is extremely small, positive and it is not significantly different from 0.

An interesting result that comes up from Table 4 is that total public expenditures become ineffective once income support is controlled for in the regression, as in regressions (3) and (4). As a result regression (5) omits the total public expenditures and adds to the regression instead the market income rate of poverty, which has a relatively weak effect on the disposable income rate of poverty. Clearly regression (5) seems to be the best regression in Table 4. It has the higher value of R-squared and its estimates of the coefficients have the higher significance. According to regression (5) the effect of income support on poverty reduction is the strongest. Every percent of GDP increase in income support reduces the rate of poverty by 1.7 percentage points.

Interestingly, although the marginal effect of total public expenditures on the poverty rate is insignificant, as demonstrated by regressions (3) and (4), its total effect is large. This can be seen in Table 4 by the size of the constant. When the variable E (or SOC) is not included in the regression the size of the constant is around 14 percent, but when E is included, in regressions (3) and (4) the size of the constant increases to close to 20 percents. This means that the overall effect of total public expenditures on reducing the rate of poverty is around 5 percentage points. This is a sizable effect, even if it does not come up significant in the regression.

Dependent Variable: $POVN_5(j, t)$					
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$POVM_5(j, t)$	0.197*** (0.08)				0.335*** (0.09)
$POVM_5(j, t-5)$		0.091 (0.10)	0.290*** (0.10)	-0.265** (0.13)	
$E_5(j, t)$	-0.375*** (0.05)	-0.426*** (0.06)			
$SOC_5(j, t)$			-0.599*** (0.08)		-0.988*** (0.16)
$PEN_5(j, t)$					0.545*** (0.19)
$L_5(j, t)$				-2.247*** (0.30)	0.507 (0.41)
CONST.	21.569*** (2.57)	27.101*** (4.41)	15.604*** (2.78)	21.340*** (4.62)	16.380*** (2.59)

Prob>F	0.0000	0.0000	0.0000	0.0000	0.0000
R-Squared	0.468	0.495	0.463	0.563	0.650
Number of observations	77	56	75	47	74

3. Significance levels of 1% are denoted by ***, of 5% by **, and of 10% by *.
4. Robust standard errors are in the parenthesis.

Table 5: Pooled Regressions of the Rate of Poverty on Fiscal Policy in OECD Countries

Table 5 presents similar tests as in Table 4, but conducted for a larger data span, that goes back in time until the 1990s. Of course, not all countries have full data going back in time as others and the data set is not balanced. This does not bother us too much, as we abstract from any country effect and focus only on the observed differences in fiscal policy. A major difference between the two Tables is that in Table 5 we do not use any longer the income support, due to missing data, but use instead a variable that includes all labor market support, which is denoted by L(j, t).

The pooled regressions in Table 5 strengthen the conclusions we derive from the results of the cross-section regressions in Table 4. The effect of total public spending on poverty reduction is larger and every percent of GDP in public spending reduces the rate of poverty by 0.4 percentage point. This is a strong effect. As we narrow our focus on expenditures directed to the poor their effect becomes stronger. Every percent of GDP in social spending reduces the rate of poverty by 0.6 percentage points. The stronger effect is observed with respect to labor market subsidies. Every percent of GDP in these subsidies reduces the rate of poverty by 2.25 percentage points. This is indeed a very strong effect. Note that in regression (5) that includes all social fiscal variables together, some of them "swallow" the effect of others. Hence, all poverty reduction is reserved to total social expenditures, which affect poverty by much more than in regression (3), where social expenditures come alone.

8. Summary and Conclusions

In this paper we examine what determines inequality in a society, and focus mainly on fiscal policy and its redistribution of income from market income to disposable incomes through direct taxation and various subsidies. Our study is purely empirical and it uses international comparison. Hence it consists of cross-country regressions or of pooled regressions and panel regressions, when more periods of time are added.

Our empirical analysis points very clearly at fiscal policy as a central determinant of inequality. It plays a major role in the redistribution of income from market incomes to disposable incomes, through direct taxation and through social subsidies, which are both highly progressive. We measure this effect of fiscal policy and find out that it is quite large. Every increase of fiscal spending of the size of one percent of GDP reduces the Gini coefficient by 0.4 percentage points. Since inequality of market incomes is quite similar across countries, the large differences we observe in inequality are mainly due to differences in fiscal policy across countries. We also find that fiscal policy has a strong effect on poverty reduction, from market incomes to disposable incomes. Here income support subsidies and similar interventions in the labor market, which are focused on the poor, play an especially large role.

Finally, our study can also hint at one possible explanation to the rise of inequality in recent decades. In addition to the standard explanations, like globalization and skill-biased technical change, our paper suggests an alternative mechanism, namely reduction of the size of the public sector. According to our study this can increase inequality significantly. This final observation leads us to another question, namely can fiscal policy and similar public policies, like labor market interventions, be part of the overall determinant of inequality, not only of disposable income, but of market incomes as well? We plan to devote our next research to this issue.

References

Alesina, Alberto, Devleeschauwer, Arnaud, Easterly, William, Kurlaut, Sergio and Wacziarg, Romain, (2003). "Fractionalization," *Journal of Economic Growth*, 8, 155-194.

Atkinson, Anthony B., (1997). "Bringing Income Distribution in from the Cold," *The Economic Journal*, 107, 297-321.

Barro, Robert J., (2000). "Inequality and Growth in a Panel of Countries," *Journal of Economic Growth*, 5, 5-32.

Chu, Ke-young, Davoodi, Hamid R., and Gupta, Sanjeev (2004). "Income Distribution and Tax and Government Social-Spending Policies in Developing Countries," in *Inequality, Growth, and Poverty in an Era of Liberalization and Globalization*, ed. by Cornia, Giovanni A., and Court, Julius. Oxford University Press, Oxford UK.

Feenstra, Robert C., Inklaar, Robert, and Timmer, Marcel P. (2013). "The Next Generation of the Penn World Table," downloadable at www.ggdc.net/pwt.

International Monetary Fund (2014a). *Fiscal Policy and Income Inequality*, IMF Policy Paper, January 2014.

International Monetary Fund (2014b). *Government Finance Statistics*, Database.

Kuznetz, Simon, (1955). "Economic Growth and Income Inequality," *American Economic Review*, 45, 1-28.

Martinez-Vazquez, Jorge, Vulovic, Violeta, and Moreno-Dodson, Blanca (2012). "The Impact of Tax and Expenditure Policies on Income Distribution: Evidence from a Large Panel of Countries," *Hacienda Pública Española*, 200, 95-130.

Meltzer, Allan H., and Richard, Scott F. (1981). "A Rational Theory of the Size of Government," *Journal of Political Economy*, 89, 914–927.

Meltzer, Allan H., and Richard, Scott F. (1983). "Tests of a Rational Theory of the Size of Government," *Public Choice* 41, 403–418.

Muinelo-Gallo, Leonel, and Roca-Sagalés, Oriol (2013). "Joint Determinants of Fiscal Policy, Income Inequality and Economic Growth," *Economic Modeling*, 30, 814-824.

Niehues, Judith, (2010). "Social Spending Generosity and Income Inequality: A Dynamic Panel Approach," IZA Working Paper no. 5178.

OECD (2014). "Employment protection annual time series data 1985-2013." Database.

O'Mahony, Mary, and Timmer, Marcel P. (2009). "Output, Input and Productivity Measures at the Industry Level: the EU KLEMS Database", *Economic Journal*, 119(538), F374-F403.

Ospina, Monica, (2010). "The Effect of Social Spending on Income Inequality: An Analysis for Latin American Countries," Center for Research in Economics and Finance (CIEF) Working Papers, No. 10-03.

Rodrik, Dani, (1998). "Why Do More Open Economies Have Bigger Governments?" *Journal of Political Economy*, 106, 99-1032.

Solt, Frederick, (2009). "Standardizing the World Income Inequality Database," *Social Science Quarterly*, 90, 231-242.

UNU-WIDER (2008). *World Income Inequality Database*, Version 2.0c, May 2008. Available at hhttp://www.wider.unu.edu/research/Database/en_GB/database/i.

Visser, Jelle (2013). "Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts, 1960-2011," ICTWSS.

World Bank (2014). World Development Indicators, database.