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THE DETERMINANTS OF REDISTRIBUTION AROUND THE WORLD

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This paper reexamines the determinants of redistribution in light of improved data and methods relative to earlier literature. In particular, we use the latest version of the UNU-WIDER's Income Inequality Database to have the best available estimates of both pre- and post-redistribution inequality for the largest set of countries and periods. We tackle head-on problems related to model specification that risk generating large biases in estimates because of mechanical associations between the dependent and explanatory variables. The results suggest that the bias in the earlier work can be substantial. The descriptive analysis highlights, in addition, how scarce the data are when it comes to information about the extent of redistribution in developing countries.

JEL Codes: H11, O11, O47

Keywords: inequality, redistribution, cross-country analysis

1. INTRODUCTION

Inequality has become a key economic and social policy concern in recent years. Researchers have documented rising top income and wealth shares, people have protested in the streets about increasing inequality, and researchers and policymakers alike have increasingly started to worry about the potential negative consequences of inequality for social distress and economic performance.[1]

Much of the discussion is quite vague about the type of inequality that is being debated. Top income shares, for example, mostly refer to market income (or factor income) inequality, whereas what should matter the most for welfare

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[1]A seminal paper foreseeing this interest is Atkinson (1997).

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analysis is net income inequality (inequality of disposable income or even consumption inequality). This brings to center stage the role of redistribution: the differences between market and net income inequality that stem from the effects of government fiscal policies, taxes, and benefits. Much less is known about *redistribution* in the world, especially outside of OECD countries, than *inequality* in the world. This is regrettable, as redistributive policies are chief among the direct and quick policy instruments that governments can use to try to curb disposable income inequality.[2]

There is a still relatively small, but expanding, literature on the determinants of redistribution, such as Milanovic (2000, 2010), Tuomala and Tanninen (2005), Karabarbounis (2011), Scervini (2012), and Luebker (2014). This work, which will be discussed in more detail in Section 2, uses data that almost exclusively originate from high-income economies. An exception is the study by Houle (2017), which uses data from the SWIID dataset (for information about the SWIID, see Solt, 2013). The SWIID data are partially based on imputations, and examining the robustness of the results based on the data remains an important task. In fact, Ferreira *et al*. (2015) and Jenkins (2015), who have evaluated cross-country inequality datasets, recommend using the WIID dataset, compiled and maintained by UNU-WIDER, instead.[3] More recent versions of the SWIID (see Solt, 2015, 2016) include corrections to some of the issues raised by Jenkins (2015). However, the fact remains that the data are in large part based on imputed values.

Our paper contributes to the literature in two main ways. First, we explore how much actual, rather than simulated, data there are about redistribution at the country level. For this purpose, we utilize the most recent version of the WIID dataset. We take the data issues in cross-country analysis of inequality and redistribution seriously, as was strongly recommended by Atkinson and Brandolini (2001) and work with real, comparable observations, rather than imputations, to describe the extent of and trends in redistribution.[4] Second, we point out that the earlier work on the determinants of redistribution suffers from an econometric flaw. Almost all studies regress redistribution, which is measured as the difference between market income and net income inequality, on market income inequality to see how inherent inequality created by the markets is associated with the redistributive efforts of the government. However, this regression leads to inconsistent coefficient estimates on the market inequality term because of the mechanical correlation between the dependent variable and market inequality. We offer a solution to this issue by using net inequality as the dependent variable instead and deduce the coefficient for redistribution from that regression.

[2]This is not to say that gross income inequality could not be affected. It clearly can be—for example, via educational policies that affect relative wage rates—but often such policies take a longer time span to take effect. Labor market regulation, on the other hand, may have more immediate effects, but we abstract from its analysis.

[3]Information about the data is available at https://www.wider.unu.edu/project/wiid-world-income-inequality-database.

[4]In fact, sometimes the officially reported pre-tax distribution can be "backed out," using the tax rules, from net incomes also in the WIID data. But this a conceptually different type of imputation than predicting pre-tax income inequality using values from neighboring countries.

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The paper proceeds as follows. Section 2 discusses the earlier literature on the determinants of inequality. Section 3 presents the data that we use. We especially discuss the merits of using real rather than imputed data on inequality and redistribution. Section 4 discusses our econometric approach and the drawbacks in some of the earlier research that deals with factors explaining redistribution. Section 5 presents our results and Section 6 concludes.

2. Literature Review

Mirrlees's (1971) optimal taxation theory and Meltzer and Richard's (1981) median voter model of redistribution have laid down the basic building blocks for thinking about inequality and redistribution. The Mirrlees model starts from society's redistributive preferences and highlights the classic tradeoff between equality and efficiency in taxation. One of the implications of the model, based on numerical simulations (Tuomala, 2016), is that greater market inequality leads to increased redistributive efforts by the government.

The Meltzer and Richard model, on the other hand, predicts that an increasing difference between median and mean incomes leads to greater political pressure for redistribution due to the pivotal role of the median income voter. Partly due to limited empirical support for the theory (Milanovic, 2000), the model has been augmented to take into account the facts that the median income voter may not be decisive because not everyone votes, electoral turnout is endogenous with respect to inequality (Mahler *et al*., 2015, Chong and Olivera, 2008), or voters' political influence depends on their income (Karabarbounis, 2011). Acemoglu and Robinson (2008) argue that even in *de jure* democracies, elites may invest in *de facto* power, which in turn tilts political power in their favor. Relating to the discrepancies between Europe and the United States (U.S.), Alesina and Glaeser (2004) argue that differences in redistributive policies are due to different political institutions as well as greater ethnic diversity in the U.S.

The determinants of redistributive policies have usually been empirically studied by regressing a measure of redistribution on a gross-income inequality measure and control variables. Table 1 summarizes some recent studies based on this method. The treatment here concentrates on the most relevant work for the present paper: for a broad literature review, see Förster and Tóth (2015). All the studies in the table except for Houle (2017) are based on data from the Luxembourg Income Study (LIS) and, while the dataset has some observations from countries outside of the OECD, a substantial majority of the observations represent high-income countries. Some of the specifications reported have included country fixed effects and the dependent variable has either been absolute redistribution (the difference between market income and disposable income Gini) or relative redistribution (absolute redistribution divided by market income Gini).

Tuomala and Tanninen (2005) find, in a model with country fixed effects, that increases in market Gini lead to an increase in absolute redistribution. Scervini (2012) comes to the same conclusion about the impact of market income inequality on relative redistribution. Luebker (2014) points out that when using the relative measure of redistribution and controlling for redistributive tastes (proxied by

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TABLE 1
A Summary of Earlier Studies

Study, Source	Dependent variable	Data	Country dummies	Estimates
Tuomala and Tanninen (2005), Table 2, column 5	Absolute redistribution	LIS, 1967–97	Yes	0.64 (ss)
Scervini (2012), Table 3, column 2	Relative redistribution	LIS, 1967–2006	No	0.79 (ss)
Mahler *et al*. (2014), Table 2, column I	Transfer redistribution	LIS, early 2000s	No	0.24 (ss)
Luebker (2014), Table 2, column 6a	Relative redistribution	LIS, 1967–2006	Yes	0.18 (ns)
Houle (2017), Table 2, column 2	Absolute redistribution	SWIID, 1960–2007	Yes	0.52 (ss)
Houle (2017), Table 2, column 4	Relative redistribution	SWIID, 1960–2007	Yes	0.73 (ss)

Notes: The table compares some earlier estimates about the association between market inequality and redistribution. Absolute redistribution is defined to be the difference between market and disposable income Gini, whereas relative redistribution is the same divided by market inequality Gini. LIS refers to the Luxembourg Income Study and SWIID to the Standardized WIID data by Solt (2009). The "Estimate" column gives the regression coefficient of market inequality in a regression where the dependent variable is either absolute or relative redistribution. "(ss)" denotes statistical significance at least at the 5 percent level and "(ns)" denotes a statistically insignificant coefficient.

answers to surveys by the International Social Survey Programme), private-sector income Gini loses significance. In contrast to other studies, Mahler *et al*. (2014) focus on transfer redistribution, which includes redistribution by the benefit side alone (i.e. not via direct taxes). On the whole, the results tend to suggest that in countries covered by the LIS data, increases in market income inequality have been associated with increased redistribution (albeit not always in a statistically significant way).

Houle (2017) uses, instead, data from the SWIID, and his main analysis is based on a panel covering 89 democracies between 1960 and 2007. He carefully discusses many of the potential shortcomings of the SWIID and, as a robustness check, also runs one set of regressions using LIS data.

The methods in all of the studies in Table 1 are subject to the criticism that the analysis is affected by the mechanical correlation between the dependent and the main independent variable. An exception is the paper by Battisti and Zeira (2016), where net inequality is explained by gross inequality; however, the authors do not discuss the mechanical correlation issue that we highlight. Finally, Muinelo-Gallo and Roca-Sagalés (2013) offer a system approach, where in one of the equations, net inequality is regressed on fiscal policy measures, such as public expenditure, and in another, gross inequality is used to predict fiscal policy variables.

The paper by Lupu and Pontusson (2011) also contains regressions where the dependent variable is social spending targeted to the non-elderly. This has the virtue that the mechanical correlation issue disappears. Their results, using data stemming from the LIS and the public spending dataset of the OECD, suggest that when the

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income differences between the high-income earners and the middle class, measured using the 90–50 percentile ratio, increase, social spending tends to increase.[5]

3. The Data

Our inequality data are drawn from the World Income Inequality Database (WIID), version 3.4 (UNU-WIDER 2017), a secondary database for income inequality data.[6] The WIID aims to gather data for as many countries and years as possible, while providing thorough background information for each data point. Depending on the source, income inequality data differ along several dimensions, including differences across income and population concepts, sample sizes, and the statistical methods used. Background information provided by the WIID helps database users to compare observations from different original sources with respect to the statistical concepts employed and their overall validity for the research question at hand. In their review and assessment of cross-country inequality analysis, Atkinson and Brandolini (2001) pointed out the necessity of knowing exactly to what type of inequality the indices refer. The WIID has been developed with this requirement in mind. The WIID also provides a quality rating of the included inequality indices.

The WIID dataset was assessed recently by Jenkins (2015). He concluded that the WIID is a reliable source for cross-country work on inequality. Many studies, including Berg *et al*. (2018), rely on the SWIID (Solt, 2013), a collection that consists both of secondary inequality measurements and of imputations (which, given that multiple imputation is used, contain simulated data). Jenkins (2015), who compared the two sources, along with the authors of a synthesis paper for the datasets reviewed (Ferreira *et al*., 2015), recommend using the WIID rather than the SWIID. The main reason for preferring the WIID over the SWIID is that the SWIID is extensively based on imputations, whereas with the WIID, users utilize only actual, not simulated, data. Moreover, Jenkins (2015) is critical of the particular type of imputations used in the SWIID, which in his opinion are complicated and opaque. The assumption of constancy of ratios of Gini coefficients across data series within groups is not innocuous and the smoothing of the series in SWIID may be excessive. Jenkins concludes that the SWIID implementation of imputation is not sufficiently credible.

Jenkins (2015) also insists that users of the WIID make clear the algorithm that they use for selecting the data. This is required as the dataset often provides multiple observations for a specific country and year. We follow this recommendation and explain in detail the type of data selection mechanism used for our analysis in Appendix B (in the online Supporting Information). When doing so, we prefer high-quality observations to lower-quality observations and estimates covering the entire population and the whole country rather than subsets of the same.

[5]Another measure that they use is skew, which is defined as the 90–50 ratio divided by the 50–10 ratio. This measure is the greater the larger are the income differences between the top and middle-income earners relative to the income differences at the bottom. They find that social spending is positively associated with skew.

[6]The dataset is open access and is available at https://www.wider.unu.edu/project/wiid-world-income-inequality-database.

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As inequality data for developing countries are only available for selected years, we take five-year averages (using all possible observations within the five-year window), with the first five-year period being 1976–80. In many cases, the most recent period is 2006–10.

While measuring the extent of redistribution by the difference between pre-tax, pre-transfer and post-tax, post-transfer inequality is commonplace and is also the approach taken in this study, one needs to remember that redistributive policies also affect the pre-tax, pre-transfer income distribution. In other words, pre-government-intervention inequality is to some extent at least endogenous to tax and transfer policies. In addition, the so-called pre-distribution policies, such as education and labor market interventions, also purposefully influence market income inequality.

The rest of the data that we use come from conventional sources.[7] Data on GDP per capita, population, and openness (share of exports plus imports of GDP) are from the World Bank World Development Indicators (2016) (WDI). In addition to the usual macroeconomic variables, we control for political and institutional factors. As regards electoral and governmental institutions, we include indicator variables for having a federal government system and a plural electoral system. The latter refers to electoral systems in which voters cast a vote for a single candidate within a voting district, with the candidate who gets most votes winning the district. The data source for the federal dummy is the International Monetary Fund. We also consider the level of democracy or autocracy using the Polity2 variable from the PolityIV project (Marshall and Gurr 2018). The variable takes incremental values between −10 and 10, with −10 referring to the most autocratic form of government and 10 the most democratic government. We control for ethnic fractionalization with the Alesina *et al*. (2003) index, which takes higher values for higher fractionalization. Lastly, we include a commodity export dummy for countries that have had average net exports of fuels, ores, or agricultural products of more than 10 percent of GDP over the 1990s and 2000s. The source for the trade data is the WDI.

We next present some descriptive material regarding the data on redistribution and recent trends in redistributive policies. Figure 1 shows how many observations on redistribution our data contain when we use five-year averaged data for the largest set of observations. It is already clear from this graph that the great majority of observations originate from high-income countries, and hence it is challenging to examine redistribution in developing countries alone because of the paucity of data.

4. Models and Methods

Studies that examine what drives redistribution typically regress either the *reduction* or the *relative reduction* in the Gini coefficient on moving from pre- to post-tax, post-transfer income. That is, researchers estimate a version of either (or both) of the regression equations

$$G_{\text{pre},it} - G_{\text{post},it} = \alpha + \beta G_{\text{pre},it} + \mathbf{z}'_{it}\delta + u_{it} \tag{1}$$

[7]For an overview of the sources, see Appendix A (in the online Supporting Information).

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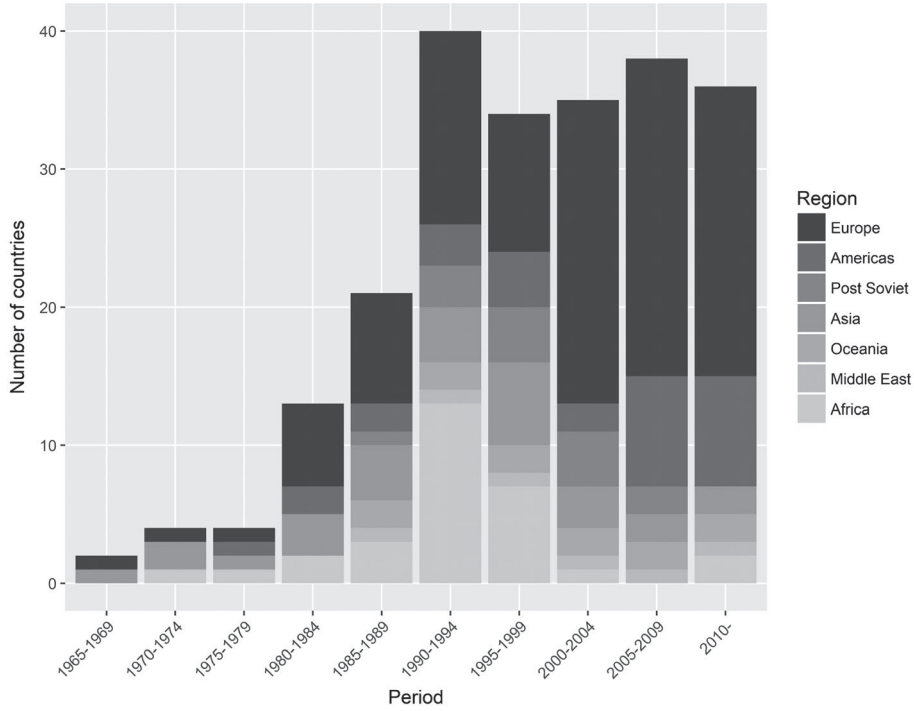

Figure 1. Redistribution Observations over Countries

or

$$\frac{G_{\text{pre},it} - G_{\text{post},it}}{G_{\text{pre},it}} = \alpha^* + \beta^* G_{it}^{\text{pre}} + \mathbf{z}'_{it}\delta^* + v_{it}, \tag{2}$$

where G is the Gini coefficient, with "pre" and "post" denoting market and disposable income, $\mathbf{z}$ is a vector of controls, u,v are error terms, and the unstarred and starred α, β, and δ are parameters to be estimated. The indices indicate country i and time period t. The main objects of interest are β and β^*, which capture the extent to which redistribution varies with market income inequality, although several elements of δ and δ^* may also be of interest.

The inclusion of G_{pre} on both the left- and right-hand sides of the regression equations leads, however, to several problems. Let us start with equation 1, which accounts for the (absolute) reduction in inequality. Ignoring, for now, the controls $\mathbf{z}$ and the intercept, and suppressing the indices, the linear projection coefficient of $G_{\text{pre}} - G_{\text{post}}$ on G_{pre} is

$$\beta = \frac{\text{E}[(G_{\text{pre}} - G_{\text{post}}) \times G_{\text{pre}}]}{\text{E}[G_{\text{pre}}^2]} = \frac{\text{E}[G_{\text{pre}} \times G_{\text{pre}}]}{\text{E}[G_{\text{pre}}^2]} - \frac{\text{E}[G_{\text{post}} \times G_{\text{pre}}]}{\text{E}[G_{\text{pre}}^2]} = 1 - b, \tag{3}$$

where b is the linear projection coefficient of G_{post} on G_{pre}.[8]

[8]If we include the controls, the above should be considered in terms of the pre- and post-Gini coefficients after having netted out all controls $\mathbf{z}$ as well as the intercepts.

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Why is estimation of β from equation 1 a problem? Arguably, for at least two reasons. First, suppose there is *no* true association of market inequality with disposable income inequality; in other words, that b is zero. Then the estimate of β is unity, but tells us nothing about the association of market income inequality and redistribution. However, even if pre- and post-inequality are related (i.e., $b \neq 0$), the inclusion of pre-inequality on both the left- and right-hand sides leads to a serious endogeneity problem; that is, by construction, u and G_{pre} are correlated.[9] The simple solution to this problem is to estimate the linear projection of post- on pre-inequality, b, in a regression equation that also includes the controls $\mathbf{z}$, and to work out the β that this implies. In other words, we estimate

$$G_{\text{post},it} = \alpha' + bG_{\text{pre},it} + \mathbf{z}'_{it}\delta' + u'_{it}, \tag{4}$$

and use the estimated b from this equation. The equation can be estimated with or without country fixed effects and with time-period dummies.

What about *relative* redistribution; that is, estimation of equation 2? Again, ignoring the controls, the intercept and the indices, the linear projection coefficient of interest is

$$\beta^* = \frac{\mathrm{E}\left[\frac{G_{\text{pre}} - G_{\text{post}}}{G_{\text{pre}}} \times G_{\text{pre}}\right]}{\mathrm{E}[G_{\text{pre}}^2]}. \tag{5}$$

The numerator of this can be rewritten as

$$\mathrm{E}\left[\frac{G_{\text{pre}}}{G_{\text{pre}}} \times G_{\text{pre}}\right] - \mathrm{E}\left[\frac{G_{\text{post}}}{G_{\text{pre}}} \times G_{\text{pre}}\right] = \mathrm{E}[G_{\text{pre}}] - \mathrm{E}[G_{\text{post}}]. \tag{6}$$

Thus, the object of interest is

$$\beta^* = \frac{\mathrm{E}(G_{\text{pre}}) - \mathrm{E}(G_{\text{post}})}{\mathrm{E}[G_{\text{pre}}^2]}. \tag{7}$$

Direct estimation of this from equation 2 is problematic because the dependent variable involves the inverse of the main right-hand-side variable. We propose, instead, that the importance of market income inequality for relative redistribution be calculated using the measure of absolute redistribution in equation 3, based on the linear projection coefficient in equation 4, divided by the sample mean of the market income Gini coefficient $\overline{G_{\text{pre}}}$; that is, by

$$\beta^* = \frac{1-b}{\overline{G_{\text{pre}}}}. \tag{8}$$

This simply relates the relative importance of redistribution to the magnitude of inequality reduction relative to average pre-redistribution inequality.

[9]The same issue arises with the approach of Milanovic (2000). In his Table 6, he regresses the difference between post- and pre-redistribution income share on pre-redistribution income share for the bottom half and quintile of pre-redistribution income distribution.

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5. Results

Here, we first present the regression results that follow the conventional analysis of the determinants of redistribution; that is, models of the type in equations 1 and 2. In other words, we explain either absolute redistribution or relative redistribution by market income inequality and covariates. Absolute redistribution is measured as the difference between market and disposable income Gini coefficients. As there are only six market income Gini observations for lower-middle-income and low-income countries, we use the gross income Gini as a proxy for the market income Gini within these country groups. Relative redistribution is defined as absolute redistribution divided by the market income Gini. In constructing the variable, we again use gross income Gini data for middle- and lower-income countries. One of the key interests is to examine the impact of underlying gross inequality on redistribution.

We present these results in Table 2. The dependent variable in columns 1 and 2 is absolute redistribution; relative redistribution is examined in columns 3 and 4. All models include time-period dummies, and columns 2 and 4 also include country fixed effects. While often models with country fixed effects are to be preferred, in our case we would tend to think that taking into account the cross-country variation in pooled models is useful because of the limited within-country variation in many of the right-hand-side variables. We therefore mostly discuss those results that stem from analyses without country fixed effects.

The results suggest that income level is, as expected, closely positively linked to redistribution. Also, countries with larger populations tend to redistribute less, but the effect is not statistically significant. The finding that ethnically diverse countries redistribute less gets some support from the earlier literature as well as from the present study. Alesina *et al*. (2001) find that ethnically more heterogenous countries tend to have lower social spending. They and Luttmer (2001) argue that individuals prefer to redistribute more to the recipients in their own ethnic group. Dahlberg *et al*. (2012) also find that increased immigration leads to lower support for redistribution.[10]

Countries with a plural electoral system or commodity exports redistribute less. The negative effect of the commodity exports on redistribution may reflect capture of natural resource rents and other corrupt behavior by the rulers,[11] or fewer incentives for investing in human capital and thereby increasing government revenues and economic growth. Related to redistribution, earlier findings indicate that resource-rich countries spend less on public health Cockx and Francken (2014), education (Gylfason, 2001), and public capital (Bhattacharyya and Collier 2014). Somewhat unexpectedly, more democracy is not associated with greater redistribution. In the fixed-effects models, most of the political and institutional variables are dropped out due to lack of within-country variation.

[10]We also estimated models without African countries to see whether the large extent of ethnic heterogeneity there explains this result. However, the negative impact of ethnic heterogeneity also holds for the sample without the African countries.

[11]Arezki and Brückner (2011), Aslaksen (2018) find that an increase in oil rents increases corruption.

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TABLE 2
DETERMINANTS OF REDISTRIBUTION, FULL SAMPLE

	A. Absolute redistribution		B. Relative redistribution	
Explanatory variables	(1)	(2)	(3)	(4)
Log GDP per capita	2.531***	3.993**	5.404***	9.007**
	(0.621)	(1.825)	(1.284)	(3.688)
Log population	−0.182	−1.914	−0.733	−5.081
	(0.404)	(4.554)	(0.833)	(8.449)
Openness	2.000	−0.700	3.213	−3.673
	(1.315)	(1.875)	(2.788)	(3.456)
Gross income Gini	0.175**	0.620***	−0.0322	0.641***
	(0.0750)	(0.0702)	(0.160)	(0.158)
Democracy	−0.339	−0.900	−0.509	−1.496
	(0.247)	(0.760)	(0.500)	(1.273)
Federation	−0.578		−1.370	
	(1.016)		(2.048)	
Ethnic fractionalization	−5.349**		−9.968**	
	(2.075)		(4.334)	
Commodity exporter	−5.599***		−10.48***	
	(1.165)		(2.424)	
Plurality system	−2.405***		−5.996***	
	(0.848)		(1.740)	
Observations	121	121	121	121
R^2	0.656	0.705	0.678	0.427
Number of countries		47		47

Note: Robust standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Underlying or inherent inequality is positively linked to redistribution in three of the four specifications. This finding is, loosely speaking, in line with political economy models (such as the median voter theorem), although one needs to bear in mind the caveats raised by Milanovic (2000), discussed in Section 2. This observation is also in line with the optimal tax tradition, initiated by Mirrlees (1971). There, redistribution at the optimum is increasing with increased pre-tax inequality.

These results should, of course, be interpreted with caution because of potential endogeneity concerns. It is certainly possible that redistribution also affects some of the right-hand-side variables. For example, if the efficiency–equity tradeoff were to hold, the level of GDP per capita would be dependent on the extent of redistribution. However, similar caveats are also relevant for much of the existing literature.[12]

We now turn to our main approach, where instead of redistribution, the dependent variable is our concept of net Gini (net income or consumption), as in equation 4. These results are presented in Table 3. Column 1 reports results from a pooled OLS and column 2 those from a country-fixed-effects regression. The

[12]We attempted to address this issue by using lagged values of all right-hand-side variables instead of the contemporaneous ones. However, the sample size is severely reduced (almost by one half), and while, for example, the sign of the income level variable remains the same in models without country fixed effects, the coefficient becomes statistically insignificant.

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TABLE 3
DETERMINANTS OF NET INEQUALITY

	Dependent variable: Net income Gini coefficient					
	A. Net inequality (baseline)		B. Lagged explanatory variables		C. Non-lagged, same sample as B	
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP per capita	−2.803***	−4.771*	−0.284	−10.19	−1.095	−6.944
	(0.546)	(2.657)	(1.085)	(8.660)	(0.990)	(5.480)
Log population	0.385	6.349	0.752*	−10.35*	0.283	−15.02***
	(0.393)	(3.859)	(0.402)	(5.855)	(0.406)	(5.024)
Openness	−1.790	1.423	−1.234	−11.14**	−1.830	−7.580***
	(1.278)	(1.839)	(1.769)	(4.059)	(1.708)	(2.718)
Gross income Gini	0.733***	0.298***	0.535***	0.0536	0.620***	0.440***
	(0.0705)	(0.0969)	(0.131)	(0.0878)	(0.130)	(0.0930)
Democracy	0.554**	0.918	−1.545***	−7.325	−2.372***	−0.293
	(0.233)	(0.725)	(0.535)	(5.062)	(0.793)	(1.510)
Federation	0.665		0.207		0.00812	
	(1.053)		(1.391)		(0.866)	
Ethnic fractionalization	5.842***		4.626		3.859*	
	(2.001)		(2.886)		(2.253)	
Commodity exporter	6.604***		4.636***		4.515***	
	(1.072)		(1.684)		(1.142)	
Plurality system	2.392***		3.168**		4.582***	
	(0.841)		(1.222)		(1.037)	
Observations	121	121	60	62	60	62
R^2	0.820	0.531	0.802	0.826	0.834	0.860
Implied absolute beta	0.267	0.702	0.465	0.946	0.380	0.560
Std error	0.0705	0.211	0.131	0.0878	0.130	0.203
Implied relative beta	0.583	1.530	1.019	2.075	0.827	1.219
Std error	0.153	0.0705	0.288	0.192	0.283	0.0930
Number of countries	47	47	29	29	29	29

Note: Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

results suggest that net income inequality is driven to a high extent by gross income inequality. The coefficient for gross income inequality, b, can be used to derive the implied coefficient on redistribution, as shown in the previous section [see equation equation (3]. This term, $\beta = 1-b$, is also reported in the table (see "Implied absolute beta") and is reasonably close to the results reported for the gross income Gini term in Table 2.[13]

The results mean that in this case, perhaps by chance, the mechanical correlation present in the redistribution equation did not cause a large bias. However, the bias appears to be much larger in the implied relative β-coefficient. This can be seen by comparing the "Implied relative beta" terms in Table 3 with the coefficient of gross income Gini in columns 3 and 4 of Table 2. One potential interpretation of the latter result is that the coefficient of market income Gini is downward biased in equation 2, and hence the new approach that we propose uncovers the underlying actual relation.

When comparing our results to those found earlier in the literature, reported in Table 1, one notices that our results from specifications without country dummies are perhaps somewhat smaller. However, with country fixed effects, our results would suggest a greater impact of market inequality on redistribution. One needs to bear in mind that the results from models without country fixed effects are probably more informative, since the between-country variation is needed to properly identify the impact of market inequality on redistribution (see the discussion at the beginning of this section).

As above, a potential worry is that the some of the right-hand-side variables are endogenous. To examine the severity of this matter, we also estimate models where all the right-hand-side variables are lagged by one period. This is, admittedly, partly problematic, as it reduces the sample size. The result from using the lagged values are presented in columns 3 and 4 of Table 3. For comparison, in Table 3, columns 5 and 6, we also present results from the previous regression (with contemporaneous right-hand-side variables), but with the same sample as in columns 3 and 4.

In these regressions, the income level of a country is still negatively correlated with net inequality, but the relationship is not statistically significant. The market income Gini is still positively correlated with net inequality, but in the model with country fixed effects and lagged right-hand-side variables, the coefficient is not statistically significant. In this sample, democracy is associated with lower net inequality. All in all, the results in Table 3 seem to suggest that reverse causality need not be a very big concern, especially as we are inclined to think that the results stemming from models without country dummies are more informative.

A concern when using data on Gini coefficients from many different sources is that the incomes on which the Gini are estimated use several different equivalence scales to account for household economies of scale. In our sample, roughly one third of the cases are based on the per capita scale, an actual household adult equivalence scale, or no adjustment, respectively. It is plausible that this affects the

[13]The standard error for the derived coefficient for the impact on absolute redistribution is the same as that of the regression coefficient for market Gini, and the standard error for the derived relative redistribution is calculated using the delta method.

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Gini estimates. To control for this source of variation in the Gini coefficients, we estimate the fixed-effects models of Tables 2 and 3 with data in which the same equivalence scale is used within each country. This reduces sample sizes by 10–15 percent, which reflects the fact that most of the full data already have a fixed equivalence scale for each country. The results, which are available in the appendix, do not change substantially.

As another robustness check, we also estimate the OLS models of Tables 2 and 3 including continent dummies to control for regional differences in redistributive preferences. The results, which can again be found in the appendix, show that the coefficient estimates on population, ethnic fractionalization, and plurality cease to be statistically significant. The gross income Gini, however, still increases redistribution in a statistically significant manner. As a further robustness check, we also explore if the relation between redistribution and underlying inequality is non-linear. We estimate the models of Tables 2 and 3 by adding the powers of gross income Gini as well as with the logarithm of the Gini. The results, again available in the appendix, indicate that the linear and increasing effect of the gross income Gini on redistribution remains the same in the non-linear specifications. If anything, the marginal effect of the gross income Gini on the redistribution decreases as the Gini increases, but the linear component dominates any non-linearities at plausible levels of the gross income Gini.

6. Conclusion

This paper uses WIID data to examine the determinants of redistribution across the world. To examine redistribution, one needs to know both inequality levels before and after government intervention but, for many countries, only disposable income inequality or consumption inequality figures are available. Actual rather than imputed information about redistribution is surprisingly and regrettably sparse, especially for developing countries. Quite how limited the data are has not, we would argue, been widely appreciated.

We also contribute to the empirical literature on the determinants of redistribution methodologically. Earlier, influential, analyses in the field have not paid attention to the problem that when inequality (the difference between market and net income inequality) is accounted for by underlying market inequality, the coefficient estimates are also characterized, in addition to any actual association, by a mechanical correlation between the left-hand-side and right-hand-side variables. We suggest a way to overcome this inconsistency by a procedure that uses the coefficient from a regression of net inequality on market inequality to deduce the association between redistribution and market income inequality.

The magnitude of the impact of the correction turned out to be dependent on whether redistribution was measured in an absolute or relative (to the pre-tax Gini) way. In the latter, the measurement error in the conventional approach was a more severe one, perhaps due to the fact that the mechanical correlation occurs from both the numerator and the denominator of the left-hand-side variable. The exercise revealed that earlier results on the determinants of redistribution need to be interpreted with care.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Appendix A. Data sources and definitions
A.1 Data Definitions and Sources for Redistribution Regressions

Appendix B. WIID data set manipulation
Table 1: Summary of earlier studies
Table 2: Determinants of redistribution, full sample
Table 3: Determinants of net inequality
Figure 1: Redistibution observations over countries

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