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Redistribution, Inequality, and Growth

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EXECUTIVE SUMMARY

Economists are increasingly focusing on the links between rising inequality and the fragility of growth. Narratives include the relationship between inequality, leverage and the financial cycle, which sowed the seeds for crisis; and the role of political-economy factors (especially the influence of the rich) in allowing financial excess to balloon ahead of the crisis. In earlier work, we documented a multi-decade cross-country relationship between inequality and the fragility of economic growth. Our work built on the tentative consensus in the literature that inequality can undermine progress in health and education, cause investment-reducing political and economic instability, and undercut the social consensus required to adjust in the face of shocks, and thus that it tends to reduce the pace and durability of growth.

That equality seems to drive higher and more sustainable growth does not in itself support efforts to redistribute. In particular, inequality may impede growth at least in part *because* it calls forth efforts to redistribute that themselves undercut growth. In such a situation, even if inequality is bad for growth, taxes and transfers may be precisely the wrong remedy.

While considerable controversy surrounds these issues, we should not jump to the conclusion that the treatment for inequality may be worse for growth than the disease itself. Equality-enhancing interventions could actually help growth: think of taxes on activities with negative externalities paid mostly by the rich (perhaps excessive risk-taking in the financial sector) or cash transfers aimed at encouraging better attendance at primary schools in developing countries, as examples. The macroeconomic effects of redistributive policies will reflect a balance between the components of the fiscal package, and it is an empirical question whether redistribution in practice is pro- or anti-growth.

So what does the historical evidence say? This paper is the first to take advantage of a recently-compiled cross-country dataset that distinguishes market (before taxes and transfers) inequality from net (after taxes and transfers) inequality and allows us to calculate redistributive transfers for a large number of country-year observations. Our main findings are:

First, *more unequal societies tend to redistribute more*. It is thus important in understanding the growth-inequality relationship to distinguish between market and net inequality.

Second*, lower net inequality is robustly correlated with faster and more durable growth, for a given level of redistribution*. These results are highly supportive of our earlier work.

And third, *redistribution appears generally benign in terms of its impact on growth; only in extreme cases is there some evidence that it may have direct negative effects on growth*. Thus the combined direct and indirect effects of redistribution—including the growth effects of the resulting lower inequality—are on average pro-growth.

While we should be cognizant of the inherent limitations of the data set and of cross-country regression analysis more generally, we should be careful not to assume that there is a big trade-off between redistribution and growth. The best available macroeconomic data do not support that conclusion.

I. INTRODUCTION

Economists are increasingly focusing on the links between rising inequality, crisis risk, and sustainable growth. Rajan (2010) underscores how inequality intensified the leverage and financial cycle, sowing the seeds of crisis, while Stiglitz (2012) stresses the role of political-economy factors (especially the influence of the rich) in allowing financial excess to balloon ahead of the crisis. Berg and Ostry (2011) document the multi-decade and multi-country evidence that greater equality can help sustain growth. This work builds on a tentative consensus in the growth literature that inequality can undermine progress in health and education, cause investment-reducing political and economic instability, and undercut the social consensus required to adjust in the face of major shocks, and thus that it tends to reduce the pace and durability of growth (Persson and Tabellini, 1994; Easterly, 2007; Berg, Ostry and Zettelmeyer, 2012).[2]

That equality seems to drive higher and more sustainable growth does *not*, in itself, support efforts to redistribute. In particular, inequality may impede growth at least in part *because* it calls forth efforts to redistribute through the fiscal system, efforts that themselves may undermine growth. In such a situation, even if inequality is bad for growth, taxes and transfers may be precisely the wrong remedy. While the literature on this score remains controversial, the notion of a tradeoff between redistribution and growth seems deeply embedded in policymakers' consciousness. The negative effect of redistributive policies is indeed the central theme of Arthur Okun's famous 1975 book on the tradeoffs between efficiency and equity and on the efficiency "leaks" that efforts to reduce inequality engender.

We should not jump to the conclusion that a treatment for inequality—redistribution—may be worse for growth than the disease itself. First, we need to ask if equality-enhancing interventions would invariably lead to a loss of economic efficiency, as Okun and others assumed. On reflection, that is too broad-brush a conclusion: we are all familiar with win-win policies that have potential both to promote efficiency *and* equality. Examples could include taxes on activities with negative externalities paid mostly by the better-off but harmful to the poor (such as, perhaps, excessive risk-taking in the financial sector), cash transfers aimed at encouraging better attendance at primary schools in developing countries, or spending on public capital or education that benefits the poor. A number of papers (such as Benabou, 2000, 2002; and Bleaney, Gemmell, and Kneller, 2001) point out that some categories of government spending—for example, public investments in infrastructure, spending on health and education, and social insurance provision—may be both pro-growth and pro-equality, while other categories may imply the tradeoffs that preoccupied Okun. The macroeconomic effects of redistributive policies are likely to reflect a balance between different components of the fiscal

[2] Others go further—beyond the scope of this paper—and focus on the social and political consequences of rising inequality trends in advanced countries (for example, Reich, 2011; Wilkinson and Pickett, 2009).

package, and it would appear to be an empirical question whether redistribution in practice is pro- or anti-growth.

One useful way forward in the face of this uncertainty is to look carefully at the evidence about the different specific elements of redistributive fiscal policies in different country contexts, attempting to draw lessons about the most efficient ways to redistribute. Here we tackle the broader and complementary question head-on: what does the historical macroeconomic evidence say about the relationship between inequality, redistribution, and growth? In particular, can we find evidence that, on average, the negative growth effects of inequality outweigh any positive growth effects of the resulting reduction in inequality?

To disentangle the various channels, we need a framework that simultaneously analyzes the effects of redistributive transfers and inequality on growth. This is essential not only for an adequate econometric specification and a correct measurement of the different effects, but also for a sensible discussion of policy. One reason the literature has been slow to carry out this simultaneous analysis is that it requires cross-country data on both inequality before taxes and transfers (so-called "market inequality") and inequality after taxes and transfers ("net inequality"). Such data are scarce and imperfect. This paper is the first to take advantage of a recently-compiled cross-country dataset (Solt, 2009) that carefully distinguishes net from market inequality and allows us to calculate redistributive transfers—defined as the difference between the Gini coefficient for market and for net inequality—for a large number of country-year observations covering both advanced and developing countries.[3]

We analyze both the growth rate over five-year horizons (panel growth regressions) and the duration of growth *spells*, as defined in Berg, Ostry, and Zettelmeyer (2012), which we think is a more useful way of assessing growth experience, especially for emerging and developing economies. Our principal findings can be summarized as follows.

First, *more unequal societies tend to redistribute more*. Among OECD countries, more inequality tends to be associated on average roughly one-for-one with higher redistribution, such that there is almost no overall correlation between net and market inequality. While the effect is weaker in non-OECD countries, it is nevertheless still present. It is thus important to distinguish between market and net inequality in trying to understand the growth-inequality nexus and to separately control for redistribution in growth-inequality work.

Second*, lower net inequality seems to drive faster and more durable growth for a given level of redistribution*. These results are highly supportive of our earlier work, now encompassing not

[3] There have been many efforts in the literature to look at either market or net inequality, but Solt (2009) breaks new ground in his efforts to make the various underlying survey data comparable across time and countries for a large number of countries.

only duration analysis but also the panel regression approach common in earlier literature, and also controlling for the net/market distinction.

Third, *redistribution appears generally benign in its impact on growth; only in extreme cases is there some evidence that it may have direct negative effects on growth*. Thus the combined direct and indirect effects of redistribution—including the growth effects of the resulting lower inequality—are, on average, pro-growth.

Against these results, it must be borne in mind that the data are particularly scarce and unreliable for redistribution, even more so than for inequality. Indeed, one possible interpretation of our results is that the data on redistribution simply do not contain enough information to infer a negative (or for that matter a positive) direct effect. We believe our results are nonetheless informative. We have used the best available data for the analysis of large numbers of countries over time. The analysis of spells inevitably requires the use of older and perhaps less comparable data, but the results for average growth hold even when the analysis is restricted to only the most reliable and recent data.

We should of course be cautious about drawing definitive policy implications from cross-country regression analysis. We know that different sorts of policies are likely to have different effects in different countries at different times, and causality is difficult to establish with full confidence. But microeconomic analyses, as useful as they are, leave one wondering: What is the overall relationship? What can we learn from looking at the forest, not the trees? What we find is that we should not assume that there is a big trade-off between redistribution and growth: the best available macro data do not support that conclusion.

The remainder of this paper is organized as follows. In Section II, we set the stage by reviewing the literature on growth, inequality, and redistribution, and in the section following that we present the data being used to carry out the empirical analysis. In Section IV we present the panel growth regressions, while in Section V we discuss the duration analysis, linking sustainability of growth to equality, redistribution, and a range of traditional determinants. A final section concludes.

II. A Review of the Literature on Equality, Redistribution, and Growth

A large literature has examined the three variables of interest in this paper, resulting in a complex set of proposed relationships. Before surveying the evidence, it is worth spending a moment to understand the possible channels (summarized in Figure 1) and also to understand why theory does not provide strong guidance on these questions.

Inequality can influence growth (line E in Figure 1) positively by providing incentives for innovation and entrepreneurship (Lazear and Rosen, 1981); by raising saving and investment if rich people save a higher fraction of their income (Kaldor, 1957); and, perhaps especially

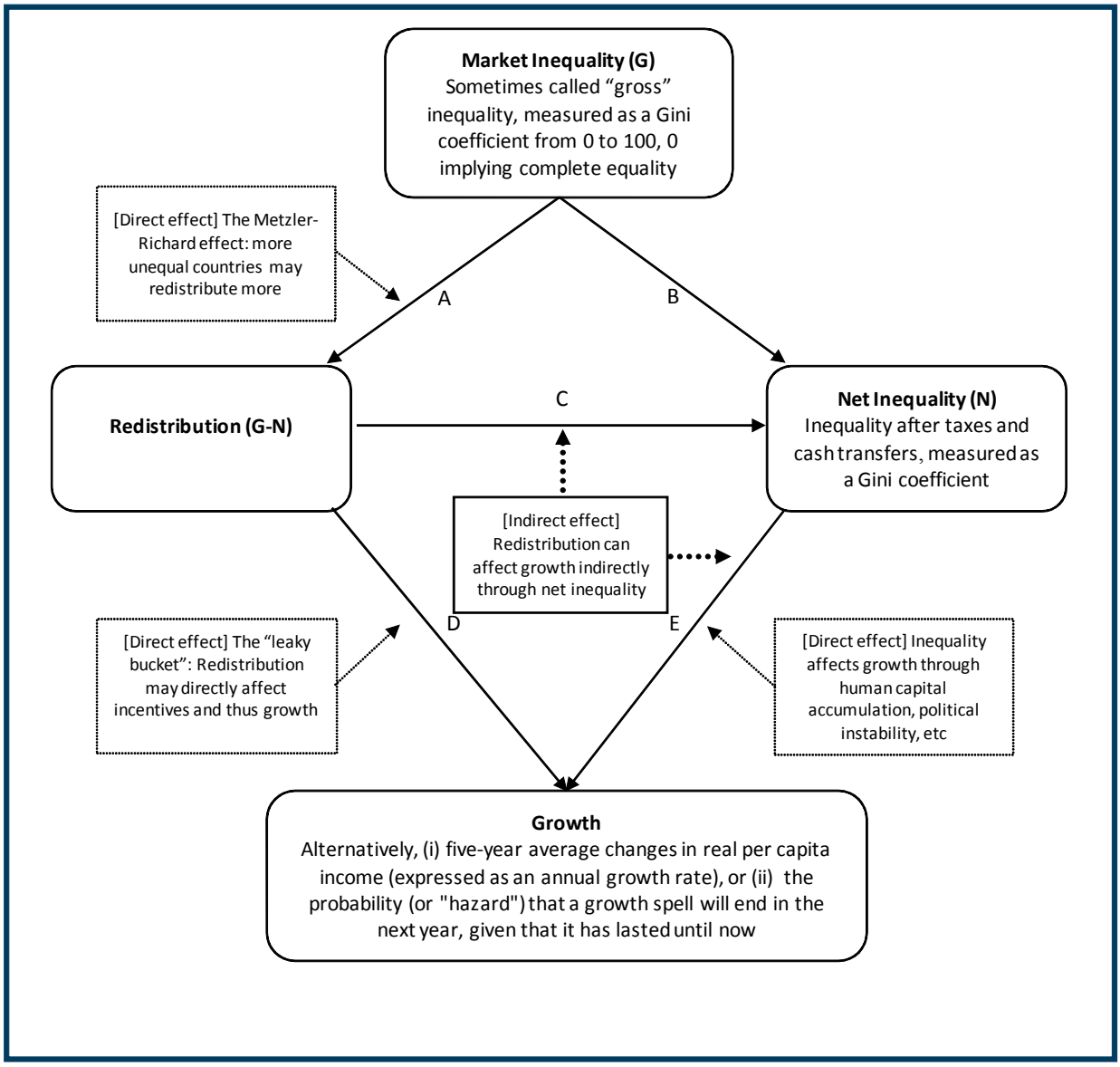
relevant for poor countries, by allowing at least a few individuals to accumulate the minimum needed to start businesses and get a good education (Barro, 2000). But inequality may be harmful for growth because it deprives the poor of the ability to stay healthy and accumulate human capital (Perotti, 1996; Galor and Moav, 2004; Aghion, Caroli, and Garcia-Penalosa, 1999); generates political and economic instability that reduces investment (Alesina and Perotti, 1996); and impedes the social consensus required to adjust to shocks and sustain growth (Rodrik, 1999). The relationship between inequality and growth may be nonlinear, as in the theoretical model of Benhabib (2003), in which increases in inequality from low levels provides growth-enhancing incentives, while increases past some point encourage rent-seeking and lower growth.

On the relationship between market inequality and redistribution (line A in Figure 1), we emphasize the channel underscored in the seminal paper of Meltzer and Richard (1981), who argue that higher inequality will create pressures for redistribution. The notion is that, at least in democracies, political power is more evenly distributed than economic power, so that a majority of voters will have the power and incentive to vote for redistribution. However, as pointed out by Benabou (2000) and emphasized by Stiglitz (2012), this need not be the case if the rich have more political influence than the poor.

On the third issue, the policy literature has focused on the direct effect (line D in Figure 1) and generally assumed that redistribution hurts growth (Okun, 1975), as higher taxes and subsidies dampen incentives to work and invest. Losses are likely to be a rising function of the tax or subsidy rate, given the convexity of deadweight costs, with losses from redistribution minimal when tax rates are low but rising steeply with the tax or subsidy rate (for example, Barro, 1990; Jaimovich and Rebelo, 2012). But some have recognized that redistribution need not be inherently detrimental to growth, to the degree that it involves reducing tax expenditures or loopholes that benefit the rich or as part of broader tax reforms (such as higher inheritance taxes offset by lower taxes on labor income). More broadly, redistribution can also occur when progressive taxes finance public investment, when social insurance spending enhances the welfare of the poor and risk taking (Benabou, 2000), or when higher health and education spending benefits the poor, helping to offset labor and capital market imperfections (Saint-Paul and Verdier, 1993, 1997). In such cases, redistributive policies could increase both equality and growth. The literature has generally ignored the overall effects of redistribution, both direct effects (line D of Figure 1) and as it acts through inequality (lines C and E), because very few papers look at both inequality and redistribution simultaneously. We return to this issue below.

Clearly, theory provides at best a partial guide on these issues, and we need to turn to the evidence. With respect to inequality and growth, the statistical evidence generally supports the view that inequality impedes growth, at least over the medium term. In a sequence that mirrors intellectual fashions on the empirics of growth, researchers have looked at rates of growth over long periods of time (for example, Persson and Tabellini, 1996; Perotti, 1996; Alesina and

Figure 1. Interrelationships between inequality, redistribution, and growth



Note: This picture shows the main channels of influence investigated in this paper. We estimate econometrically the direct effects of redistribution (line D) and net inequality (line E), in each case in effect holding the value of the other variable constant. We also calculate the "total effect" of redistribution on growth. We assume that redistribution does not affect market inequality, so redistribution affects net inequality one-for-one. The total effect is thus the sum of the estimated direct effect (line D) and the indirect effect, which is a combination of the effect of redistribution on net inequality (line C) and the estimated direct effect of net inequality on growth (line E). There are many other arrows one could draw in the picture, such as from growth back to inequality and redistribution. In addition, there are possible channels that relate the *levels* of income, inequaltiy, and redistribution. The paper emphasizes those shown here, as discussed in the text.

Rodrik, 1994), the level of income across countries (Easterly, 2007), and the duration of growth spells (Berg, Ostry and Zettelmeyer, 2012), and have found that inequality is associated with slower and less durable growth. The few exceptions (Forbes, 2000; and Banerjee and Duflo, 2003) tend to pick up ambiguous short-run correlations (Aghion, Caroli, and Garcia-Penalosa, 1999; and Halter, Oechslin, and Zweimüller, 2010).

The evidence on the relationship between inequality and redistributive transfers is not clear-cut, but part of the ambiguity stems from the fact that many studies are assessing imperfect proxies for redistribution, such as social spending or tax rates (Perotti, 1996; and Bassett, Burkett, and Putterman, 1999). While we may think of some categories of spending as redistributive (such as education or social insurance spending), they need not be redistributive in practice: consider spending on post-secondary education in poor countries or on social protection for formal sector workers in many developing countries. Milanovic (2000) shows that when direct measures of redistribution are used, the evidence is supportive of the Meltzer-Richard hypothesis: more unequal societies do engage in more redistribution.

The empirical studies on the relation between redistribution and growth are also somewhat divided. When studies look at presumptive indicators of redistribution (such as taxes or government spending), they tend to suggest that more redistribution is detrimental to growth. On the revenue side, there is surprisingly little evidence that increases in tax rates impede medium-to-long-run economic growth. Overall, it seems hard to improve on the conclusions of Tanzi and Zee (1997), who find some general indication that the relationship between growth and the level of total taxes or of income taxes is negative but that this relationship is not robust and is sensitive to model specification. With respect to spending, Lindert (2004) sees something of a "free lunch" paradox in that some categories of public spending that are redistributive have no apparent adverse impact on growth (for example, spending on health and education, or tax-financed infrastructure spending).

It bears emphasizing that the literature has found it difficult to disentangle cause and effect definitively in these relationships. Some analysts have examined variations in inequality that are arguably exogenous and looked at resulting implications for the level of income.[4] Others have relied on the use of lagged information to try to tease out cause and effect. With both approaches, the literature suggests that there is a causal link from inequality to growth. Another strand of the literature has looked at the reverse question of the effect of growth or the level of income on inequality. For us, the main concern would be if high growth led to more equality, in which case we would be especially worried that we were picking up this reverse effect rather than causality from equality to high growth. However, the literature, which has focused on whether a higher level of income is associated with higher or lower inequality, has reached something of a consensus that there is no overall net effect (Dollar and Kraay, 2002; Dollar, Kleinberg, and Kraay, 2013). The fact that we will relate growth to lagged equality, and that we will use statistical procedures designed to tease out one-way causation, is further comfort. Finally, in our empirical work, we will relate growth to lagged inequality while controlling for the lagged level of income, so we are controlling for any long-run relationship between the

[4] Easterly (2007) examines the effects of inequality associated with colonial landholding patterns. Some countries are more unequal now, he argues, as a legacy of plantation-based agricultural systems dictated by geography. Such variations in inequality seem to lower per capita income.

level of income and the level of inequality, such as when countries tend to become more (or less) equal as they develop. In other words, we are asking, for a country of a given income level, what does having more or less inequality say about future growth prospects?

Cause and effect are also difficult to establish definitively with respect to the relationship between market inequality and redistribution. Much of the literature on redistribution assumes that market inequality drives redistribution, through the political economy/Meltzer-Richard-type effects. For example, Caminada, Goudswaard, and Koster (2012), OECD (2011), and Paulus and others (2009), all assume that redistributive fiscal policies reduce net inequality, given market inequality; IMF (2014) essentially makes the same assumption in its analysis of fiscal redistribution. However, clearly redistribution can influence behavior in ways that may change labor supply and market wages and thus market inequality as well. There is little evidence to serve as a guide on the sign and magnitude of the effects, particularly since there are two potentially off-setting effects. Redistribution that takes from the rich and gives to the poor is likely to reduce the labor supply of both the rich (who are taxed more) and the poor (insofar as they receive means-tested benefits that reduce incentives to work). Whatever effects this has on market incomes, they are likely to be roughly offsetting insofar as they affect both groups in the same direction.

What does one make, then, of this enormous literature? Four lessons stand out. First is the critical value of using data that are appropriate to the question at hand. For instance, the analytical basis for inequality's effect on growth really concerns net (post-tax) inequality, which affects incentives as well as prospects for social stability and consensus. Yet most previous studies paid little attention to this critical distinction, and they often combined pre- and post-tax data. A second lesson is to be aware that there are complicated interconnections across the different variables of interest—growth, inequality, and redistribution—implying the need for a joint empirical analysis. A third lesson is to be open-minded as to what the empirical analysis may show: the theory has multiple possible channels in play. This is especially true for the different proxies of redistribution and their effects on growth (with positive or negative effects both being ex ante plausible). And the final lesson is the need to be aware of the scarcity of data. The analysis of the duration of growth spells, in particular, requires looking back far enough to observe the beginning of the spell and thus to consider the inclusion of some data from earlier and possibly less-comparable surveys in developing countries. Against this background, we turn in the next section to discuss the data we use and some stylized facts.

III. Inequality and Redistribution: Some Facts

A defining constraint of previous studies on inequality and growth is the lack of data on both net and market inequality measures on a comparable basis for a large number of countries. This has made it hard for researchers to distinguish between the effects of inequality and those of redistribution. There are numerous problems with the quality and coverage of the surveys,

particularly for developing countries and in the more distant past. But perhaps the most salient issue is that while there are many household surveys of distribution, they are generally not comparable. For example, some measure income per capita and some per household; some try to measure disposable income, others total spending.

Solt (2009) represents the best effort so far to address these problems, combining information from available surveys to infer comparable series of the Gini coefficient for net and market inequality for as many countries and as many years as possible.[5] He assembles inequality measures from available surveys, making a judgment about when the quality of the survey warrants inclusion in the dataset. Redistribution is defined as the difference between the market and net inequality series. The resulting series are statistically uncertain, and judgment is needed on which observations meet some minimum information threshold.[6]

Table 1 presents some correlations between our measure of redistributive transfers and a number of proxies of redistribution that have been used in the earlier literature. The table shows that the correlations are in the range of about one-half to three-quarters. We find it reassuring both that our measure is highly correlated with many common-sense direct measures of transfers, and that it may also contain unique information (since the correlation is well below 100 percent). This is consistent with the observation that many presumptively redistributive transfers may not be so in particular cases. It also may reflect the fact that net inequality in Solt (2009) does not generally capture the effects of in-kind provision of goods and services by the government or of indirect taxes, because these are not usually captured in the underlying household surveys.

We now take a first look at the trends on inequality and redistribution. Figure 2 portrays the evolution of inequality across decades, with each box plot presenting the distribution of market and net inequality in OECD and non-OECD samples. Three points emerge. First, from the top

[5] Solt divides the surveys into 21 types and uses the entire dataset to infer how to map each of these 21 survey types into standard measures of net and market inequality. He defines net inequality as that associated with income after direct taxes and subsidies, and market inequality as pre-tax and pre-subsidy income. Version 3.1 of the Solt (2009) data set, used in this paper, covers some 153 developing and advanced countries for as many years as possible from 1960 to 2010. Solt (2009) follows the broader literature in interpolating for some observations that fall between but close to actual survey years. Lustig, Pessino, and Scott (2013) present a more complete picture for a few countries in Latin America, but this does not constitute a broad enough sample for our purposes.

[6] We follow Solt (2009) and restrict ourselves to a more reliable subsample in our baseline. We investigate and present below the sensitivity of our results to two different samples, a more expansive one that uses all the available data and a more restrictive one as in Solt (2009). All these samples are described in the notes to Table 4.

Table 1. Correlation between redistribution and transfers 1/

Name of transfers variable	Correlation coefficient
Tax revenue (percent of GDP) (WBWDI)	0.51
Subsidies and other transfers (percent of expense) (WBWDI)	0.49
Social security benefits paid by general government (percent of GDP) (OECD)	0.55
Current transfers received by households (percent of GDP) (OECD)	0.52
Subsidies (percent of GDP) (OECD)	0.42
Social expenditure (percent of GDP) (OECD)	0.68
Total tax revenue (percent of GDP) (OECD)	0.70

Source: SWIID 3.1, World Bank World Development Indicators (2013), OECD National Accounts database (2012), and authors' calculations.

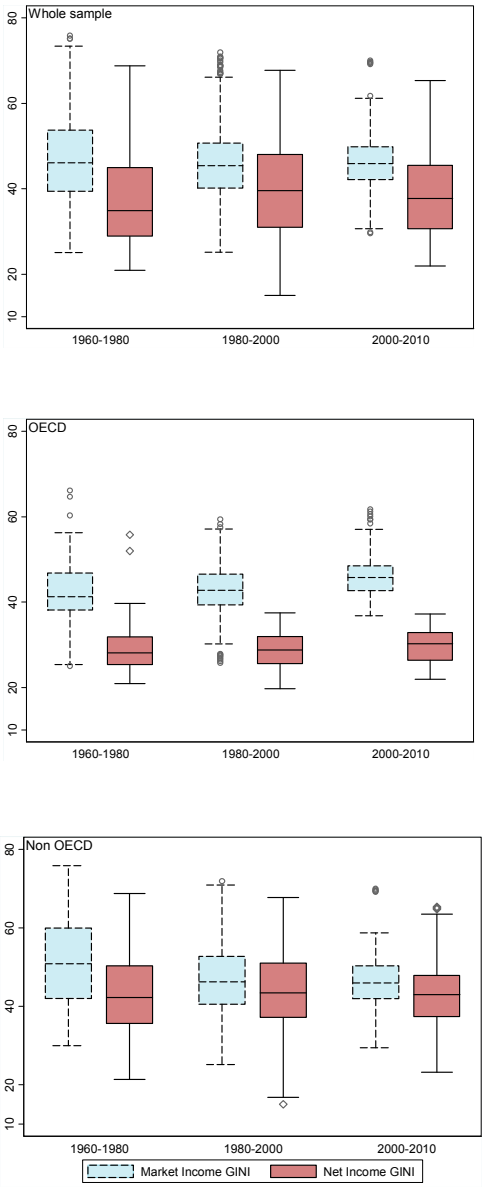
1/ Redistribution is calculated as the difference between market and net income inequality.

panel, global median inequality has held remarkably steady over the past half century. Second, this constancy hides some important differences across groups: market inequality has been rising over the past three decades in the OECD (middle panel) and falling in developing countries (bottom panel). And third, the gap between market and net inequality is much more pronounced in industrial countries than in the developing world (comparing the middle and bottom panels), reflecting the former's more extensive tax and transfer systems. Net inequality has risen, however, in the OECD over the past several decades, as redistribution has not kept pace with the rise in market inequality (OECD, 2011; IMF, forthcoming).[7]

We have stressed group average inequality and how this has evolved through time. Another perspective focuses on cross-country variation. For example, do countries with more market inequality tend to redistribute more? Figure 3 compares net inequality on the vertical axis with market inequality on the horizontal axis (each point represents one country in the latest year for which data are available). A country on the 45-degree line would have identical net and market inequality. A country far below this line would have much lower net than market inequality (a large transfer). Most countries lie below the line, implying some degree of redistribution. And on average, the distance from the line grows with the amount of market inequality, showing that relatively unequal countries do tend to redistribute more. OECD countries engage in a large amount of redistribution (middle panel). Indeed, in this group, countries with relatively high market inequality have only slightly above-average net inequality (the points in the panel are clustered roughly along a horizontal line). Of course, this is just an average result that does

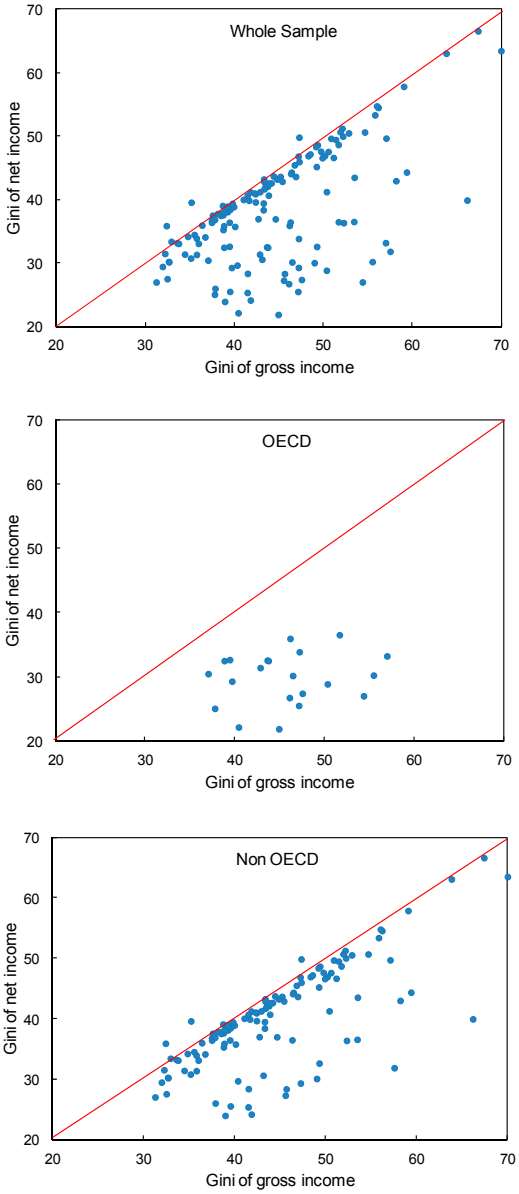
[7] Much of this increase in inequality in the OECD has been in the income of the highest 1 percent or even more rarified groups. This paper uses the Gini because it is much more widely available, but the Gini is relatively insensitive to movements at the tail of the distribution, partly because the richest households tend to be underrepresented in the household surveys used to measure it (Alvaredo, 2011).

Figure 2. Evolution of market and net inequality, 1960-2010



Source: SWIID 3.1 and authors' calculations.
Note: The Gini coefficient is a measure of inequality that varies between 0 (complete equality) to 100 (all income goes to one individual). Box and whisker plots represent the inter-quartile range first and third quartile values, with the middle line inside the box representing the median. The lower (higher) end of the whiskers represents the lowest data point within 1.5*IQR of the lower quartile (highest data point within 1.5*IQR of the upper quartile).

Figure 3. Market and net inequality by country group



Source: SWIID 3.1 and authors' calculations.
Note: Latest available year of market and net inequality; the line represents the 45 degree line.

not hold in any particular country or even for the whole group over time. One way to put it is that relatively unequal countries are those that have a small amount of redistribution given their level of market inequality.

Table 2 confirms statistically the relationship between market inequality and redistribution. The estimated effect is substantial: in our baseline specification, an increase in market inequality from the 50th to the 75th percentile of the sample (that is, from a market Gini of 45 such as the Philippines in 2005 to 51 such as Nicaragua in 2005) is associated with an increase in redistribution by 3 Gini points. The relationship is much stronger in the OECD sample than in the rest of the sample, where it is nonetheless still significant.[8]

IV. Inequality, Redistribution, and Growth: Empirical Results

We now take a look at the evidence on the relationship between growth on the one hand and inequality and redistribution on the other. We adopt two econometric approaches. First, we follow the literature and examine *medium-term growth* and our variables of interest. Specifically, we ask how average growth over a five-year period depends on a variety of

Table 2. Correlation between market inequality and redistribution 1/

	Dependent Variable: Redistribution		
	Whole sample	OECD countries	Non-OECD countries
Variable	(1)	(2)	(3)
Market inequality	0.485***	0.613***	0.415***
	(0.0537)	(0.0916)	(0.0578)
Log(initial income)	1.212	0.048	1.299
	(1.0184)	(3.3695)	(1.0629)
Constant	-26.057***	-12.858	-25.923***
	(9.1080)	(35.2341)	(9.1163)
Number of Observations	800	198	602
R-squared	0.877	0.902	0.828

Source: Penn World Tables version 7.1, SWIID 3.1, and authors' calculations.

1/ The table reports results from the fixed effects regression over three samples of country groups. Robust standard errors in brackets where *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

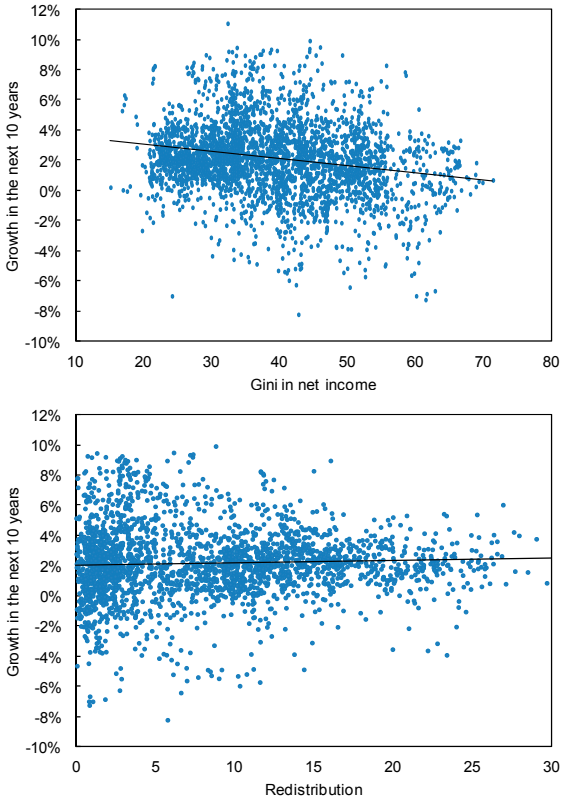
lagged indicators, including the level of income, the quality of institutions, and especially important in our setting, the level of inequality and extent of redistributive transfers. Second, we look at the *duration of growth spells*. This approach recognizes that economic growth does not follow smooth patterns but often abruptly switches between persistent periods of stagnation, takeoff, plateaus, and valleys (Pritchett, 2000). Many growth takeoffs fizzle after a few years; critical to successful development over the long term is thus the ability to sustain

[8] Additional estimations (not shown for brevity) control for other determinants of redistribution such as the degree of democracy, investment, population growth, as well as possible non-linearities. The estimations in Table 2 control for country-specific fixed effects and thus focus on the variation across time within countries. The results are similar when we use estimation methods that also explore between-country variations (random effects), and they are similar though somewhat attenuated when we use lagged inequality.

growth rather than to ignite it. We follow Berg, Ostry and Zettelmeyer (2012) and define spells as periods of at least five years during which growth is above 2 percent *and* significantly higher than during preceding years.[9]

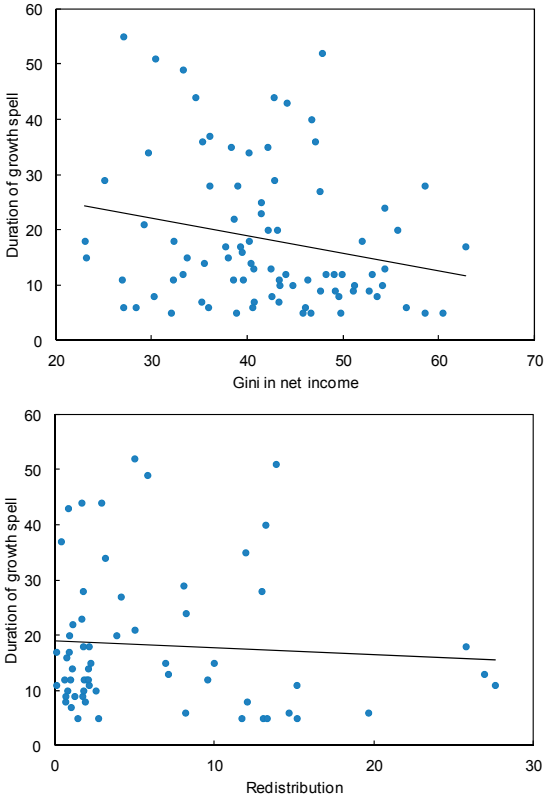
We can observe in Figure 4 that there is a strong negative relation between the level of net inequality and growth in income per capita over the subsequent period (top panel), and there is a weak (if anything, *positive*) relationship between redistribution and subsequent growth (bottom panel). We can observe roughly similar simple correlations for spell length (Figure 5), with a strong negative relationship between the level of net inequality and the duration of growth spells and a weak (in this case slightly negative) relationship between redistribution and the duration of growth.

Figure 4. Growth, inequality, and redistribution



Source: Penn World Tables version 7.1, SWIID 3.1, and authors' calculations.
Note: Simple correlations between growth in the next 10 years, and the average net income inequality and transfers for a sample

Figure 5. Duration of growth spells, inequality, and redistribution



Source: Penn World Tables version 7.1, SWIID 3.1, and authors' calculations.
Note: Simple correlation between length of growth spells, and the average net income inequality and transfers during the spell. Spells that end in-sample are included; minimum spell length is 5 years.

[9] Looking over the past four decades, a country that spends all of its time in a growth spell (as defined below) enjoys average annual growth about 3½ percentage points higher than a country that spends only a fifth of the time in a growth spell.

A. Medium-term growth

It is important to go beyond simple correlations. Much else is at play in driving growth. Moreover, we know that our variables of interest are themselves interrelated. Thus, we need to see how the relationships hold up when both inequality and redistribution are included simultaneously, and with the inclusion of standard controls. A degree of humility is warranted in defining a baseline specification: not only is there no unanimity in the empirical growth literature on the precise set of controls to be included, in our case the complex set of interrelations among the controls (for example, inequality may impact growth not only through a physical or human capital investment channel but also other channels) complicates the specification issue considerably.[10]

Our basic specification is a stripped-down standard model in which growth depends on initial income, net inequality, and redistribution (column 1 of Table 3). We find that higher inequality seems to lower growth. Redistribution, in contrast, has a tiny and statistically insignificant (slightly negative) effect.

These results are inconsistent with the notion that there is on average a major trade-off between a reduction of inequality through redistribution and growth. If there *were* such a trade-off, then the coefficient on redistribution should be not just negative but more negative than that on inequality. If that were the case, then redistribution that reduced inequality would on average be bad for growth, taking into account both the direct effect of higher redistribution and the effect of the resulting lower inequality. The results in column (1) decisively reject that hypothesis: the coefficient on net inequality is clearly negative while that on redistribution is close to zero.[11] This implies that, rather than a trade-off, the average result across the sample is a win-win situation, in which redistribution has an overall pro-growth effect, counting both potential negative direct effects and positive effects of the resulting lower inequality.[12]

Figure 6 presents these results graphically. So that we are comparing apples to apples, the height of the bar represents the effect on the growth rate of increasing the value of the variable

[10] If inequality or redistribution affects growth mainly by changing investment behavior, then adding investment as a control may result in only a weak effect of inequality or redistribution (since the specification gives the effect of inequality or redistribution, holding constant the level of physical or human capital investment).

[11] A statistical test that takes into account the uncertainty about both estimates rejects the notion that this difference could occur by chance. Formally, the statistical test decisively rejects the hypothesis that the coefficients of equality and redistribution are equal.

[12] In terms of Figure 1, the total effect is represented by lines C, D and E combined. For the estimation of the direct effects (lines D and E), we can be agnostic about whether there is significant two-way causality between redistribution and market inequality (whether line A should have arrows at both ends), because our multivariate techniques isolate the effects of each variable holding the other constant. However, our calculation of the overall effect of redistribution does assume that redistribution has no effect on market inequality, say by changing relative labor supplies at different skill levels and hence relative wages.

Table 3. The effect of inequality and redistribution on growth 1/

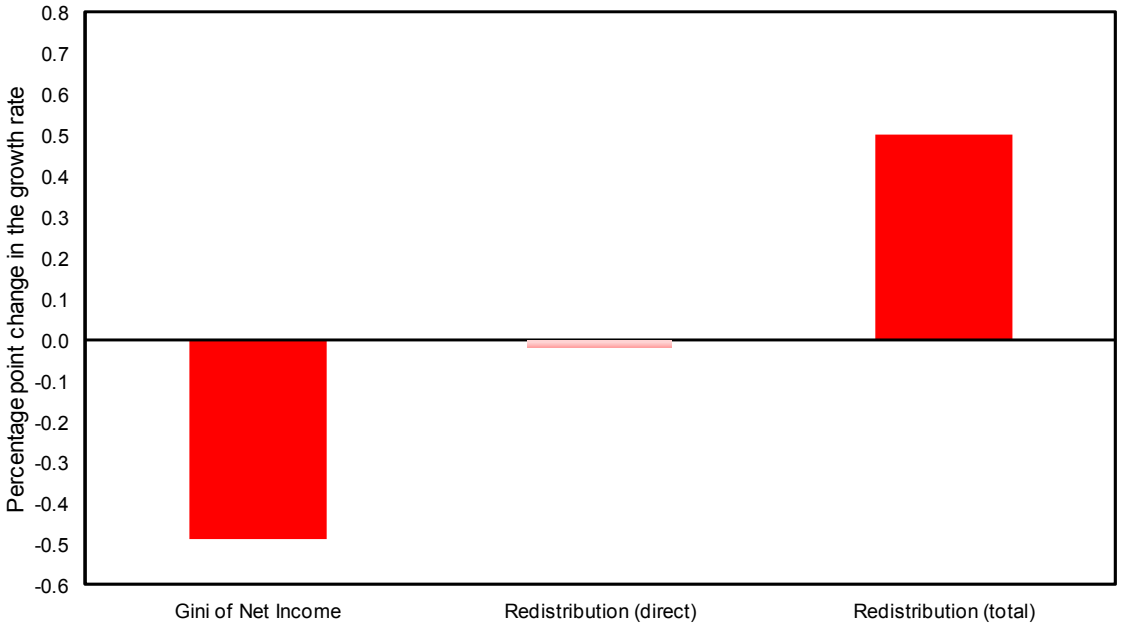
	Dependent Variable: growth rate of per capita GDP			
	Baseline	Baseline + controls		
	(1)	(2)	(3)	(4)
Log(initial income)	-0.0079**	-0.0140***	-0.0255***	-0.0214***
	(0.0034)	(0.0029)	(0.0053)	(0.0059)
Net inequality	-0.1481***	-0.1120***	-0.0901***	-0.1012**
	(0.0339)	(0.0385)	(0.0329)	(0.0470)
Redistribution	-0.0028	0.0250	0.0498	0.0582
	(0.0473)	(0.0412)	(0.0474)	(0.0488)
Log(investment)		0.0194**	0.0249***	0.0072
		(0.0076)	(0.0071)	(0.0082)
Log(population growth)		-0.0480**	-0.0214	-0.0074
		(0.0216)	(0.0186)	(0.0247)
Log(total education)			0.0406***	0.0334**
			(0.0131)	(0.0142)
Large negative terms of trade shock				-0.0202***
				(0.0063)
Political institutions				-0.0015
				(0.0081)
Openness				0.0229***
				(0.0076)
Debt liabilities				-0.0135***
				(0.0039)
Constant	0.1368***	0.2035***	0.1697***	0.1654**
	(0.0334)	(0.0491)	(0.0458)	(0.0690)
Number of observations	800	800	720	544

Source: Income, investment/GDP, and openness (Penn World Tables 7.1); redistribution and gini (SWIID 3.1); population growth (WEO); average years of primary and secondary schooling (Barro and Lee, 2012); political institutions from -10 (most autocratic) to 10 (most democratic) (Polity IV); external debt/GDP (Lane and Milessi-Ferretti, 2007, updated); goods terms-of-trade = 1 when the annual change is in the bottom 3 deciles (WEO). For details see Berg et al. (2012).
1/ System GMM estimation. Robust standard errors in brackets where *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

in question from the median value in the sample to the 60th percentile. We can see that an increase in net Gini from 37 (such as in the United States in 2005) to 42 (such as in Gabon in 2005) decreases growth on average by 0.5 percentage points, that is, from 5 percent to 4.5 percent per year, holding redistribution and initial income constant. And we can see that an increase in redistribution from the 50th to the 60th percentile decreases the growth rate very slightly, controlling for inequality and initial income. We also show in the third column the *total* effect of such a 10-percentile redistribution on the growth rate. This total effect is the sum of (i) the direct effect from changing redistribution while keeping the net Gini constant plus (ii) the growth impact of the resulting decline in net Gini. The net effect is to increase the annual growth rate by about 0.5 percentage points.

Do our results hold when standard growth determinants are also included? Columns 2–4 of Table 3 represent various plausible specifications: first with physical and human capital and then with a number of additional standard growth determinants such as external shocks, the quality of institutions, and measures of openness to trade. The lesson from these columns (and many others we do not show here) is that the inclusion of these additional determinants does not change our conclusions about inequality and redistribution. In particular, inequality is always significant while redistribution is not.[13]

Figure 6. The effect of inequality and redistribution on growth



Source: Penn World Tables version 7.1, SWIID 3.1, and authors' calculations.
Note: This figure presents the results from Table 3, column 4. For each variable, the height of the column shows the increase in the 5-year average real per capita income growth associated with an increase in that variable from the 50th to the 60th percentile, with other variables at the 50th percentile. The lighter shade of the redistribution column reflects the fact that this effect is imprecisely estimated and is not significantly different from zero. The calculation of the total effect of redistribution assumes that redistribution has no effect on market inequality.

As discussed in the literature review, it is plausible that a given increase in inequality may be more harmful for growth if the level of inequality is already high. If we allow the data to speak, however, by allowing the effect of inequality to differ when the level of inequality is already high, we find little evidence of such nonlinearities. Similarly, we find no evidence of such nonlinear effects of redistribution on growth.

[13] Results are reported using system-GMM where potentially endogenous right-hand side variables are instrumented using appropriate lagged values and first differences. The technique appropriately exploits both the cross-sectional and time-series variation in the data. For all results presented, standard tests for the validity of the instruments and first and second-order serial correlation are satisfied.

Table 4. Alternative samples: inequality, redistribution, and growth 1/ 2/

	Dependent Variable: growth rate of per capita GDP		
	Full	Baseline	Restricted
	(1)	(2)	(3)
Log(initial income)	-0.0085***	-0.0079**	-0.0072*
	(0.0026)	(0.0034)	(0.0038)
Net inequality	-0.1124***	-0.1481***	-0.1422***
	(0.0305)	(0.0339)	(0.0457)
Redistribution	0.0284	-0.0028	-0.0428
	(0.0328)	(0.0473)	(0.0626)
Constant	0.1231***	0.1368***	0.1371***
	(0.0271)	(0.0334)	(0.0439)
Number of observations	948	800	439

Source: Penn World Tables version 7.1, SWIID 3.1, Lane and Milessi-Ferretti database, Polity IV, and authors' calculations.

1/ The table reports results using the baseline sample and systems GMM estimation instrumenting for endogenous variables. Standard tests for the joint validity of the instruments, and first and second order serial correlation are satisfied. Robust standard errors in brackets where *, **, and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

2/ The "full" sample includes all available observations in Solt (2009). The "baseline" sample, starts with the "full" sample and removes a set of specific observations where Solt concludes that the raw surveys are unreliable. In addition, it requires that one of two conditions be satisfied in order to include an observation, each designed to ensure that the redistribution measure is informative: either (a) that the country contain at least one survey of some sort of net concept (e.g. disposable income or expenditure) and one market concept (e.g. personal market income), so that there is country-specific information on redistribution itself from the survey data for that country; or (b) that uncertainty associated with estimated redistribution is very small relative to the size of redistribution. The "restricted" sample, presented in Solt (2009), in addition strikes out all observations for developing countries prior to 1985 and developed countries prior to 1975. It also requires that there be three surveys, not one as in the "baseline" sample, for each income concept in criteria (a), and it does not use criterion (b).

The baseline sample we have used for all these results represents a compromise between using the full sample and using the strictest criterion to throw out potentially less informative data. We illustrate with Table 4 what happens when we make different choices in this dimension. Using the specification from column 1 of Table 3, the results in Table 4 are similar across all samples: higher inequality is associated with lower growth while redistribution is generally insignificant, especially in the smallest sample (column 3), with just a hint of a *positive* albeit insignificant relationship between redistribution and growth in the full sample (column 1).[14]

[14] Separating the sample, we find that higher inequality is bad for growth for both OECD and non-OECD countries (with the effect higher in OECD than in non-OECD countries), while redistribution remains insignificant. This is in contrast with the the results of Thewissen (2013), who looks at similar issues for a smaller set of OECD countries using the LIS inequality database and World Top Income data and finds no robust association between either inequality or redistribution and growth. However, unlike us he uses a fixed-effects

(continued…)

In sum, then, inequality remains harmful for growth, even when controlling for redistribution. And we find no evidence that redistribution is harmful. The data tend to reject the Okun assumption that there is in general a trade-off between redistribution and growth. On the contrary, on average—because with these regressions we are looking only at what happens on average in the sample—redistribution is overall pro-growth, taking into account its effects on inequality. And these results do not seem to depend on the levels of inequality or redistribution. Moreover, they hold even in the restrictive sample, which makes relatively conservative assumptions about which data to include in the regression, as well as in the full sample, which makes use of all available data.

B. Growth spell duration

We now turn to growth spells. Our statistical approach here, following Berg, Ostry, and Zettelmeyer (2012), borrows from the medical literature that aims to gauge, for example, someone's risk of death conditional on factors such as whether the person is a smoker, his or her weight, gender, and age (time "in the spell"). Here we assume that the probability that a growth spell will end next year (the 'hazard') depends on its current length and various possible determinants, measured either in the current year (lagged one year relative to the potential end of the spell) or at the beginning of the spell. As with our panel regressions, we focus on a limited set of covariates, in addition to our two variables of interest (inequality and redistribution), and examine how the results hold up in the face of a more extensive set of controls and across different sub-samples.

Our baseline specification is represented in the first column of Table 5, where we relate the hazard to initial income at the start of the spell, and inequality and redistribution during the spell. The coefficient on each covariate represents the change in the probability that the spell will end in the next year for a one-unit change in the given independent variable. As is typical with such regressions, the coefficients are expressed as a ratio. A coefficient of 0.9 means that a unit change in the regressor decreases the expected duration of the spell by 10 percent; a coefficient of 1.1 means it increases expected duration by 10 percent, and a coefficient of 1 implies that it has no effect on duration.

As with the growth regressions, there is some *a priori* reason to think that the effects of inequality and/or redistribution might be nonlinear. However, we find no evidence in the data of a nonlinear relationship between inequality and spell duration. Thus, our baseline specification includes only a linear effect. For redistribution, in contrast, we do find evidence for a nonlinear relationship between redistribution and spell duration. Thus, the baseline specification in column 1 of Table 5 divides observations into those where the degree of

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methodology, which does not account for the cross-sectional variation of inequality and redistribution (and which is biased in the presence of lagged dependent variables, as in both his and our specifications).

redistribution is very large (the top 25th percentile of all observations) and those where it is moderate (the rest of the distribution).[15]

Table 5. The effect of inequality and redistribution on the duration of growth spells 1/

	Dependent Variable: Risk that the growth spell will end			
	Baseline	Baseline + controls		
	(1)	(2)	(3)	(4)
Net inequality	1.060**	1.050*	1.060**	1.074**
	(0.0266)	(0.0266)	(0.0291)	(0.0314)
Redistribution x Top 25th percentile	1.098***	1.099***	1.055	0.990
	(0.0322)	(0.0329)	(0.0378)	(0.0567)
Redistribution x Bottom 75th percentile	0.987	0.961	0.971	0.938
	(0.0690)	(0.0735)	(0.0695)	(0.0734)
Log(initial income)	1.024	1.026	1.077*	1.216***
	(0.0318)	(0.0318)	(0.0413)	(0.0844)
Log(investment)		3.050**		
		(1.7293)		
Log(population growth)		1.201		
		(1.7085)		
Log(total education)			0.694	0.845
			(0.2705)	(0.4260)
Large negative global interest rate shock			2.719**	3.198**
			(1.1700)	(1.4887)
Large negative terms of trade shock			1.391	1.153
			(0.6620)	(0.5945)
Political institutions				0.924*
				(0.0398)
Openness				0.990
				(0.0066)
Debt liabilities				1.001
				(0.0027)
Number of observations	640	640	609	549
Number of total spells/number of complete spells	62/28	62/28	55/23	49/20

Sources: See notes to Table 3.

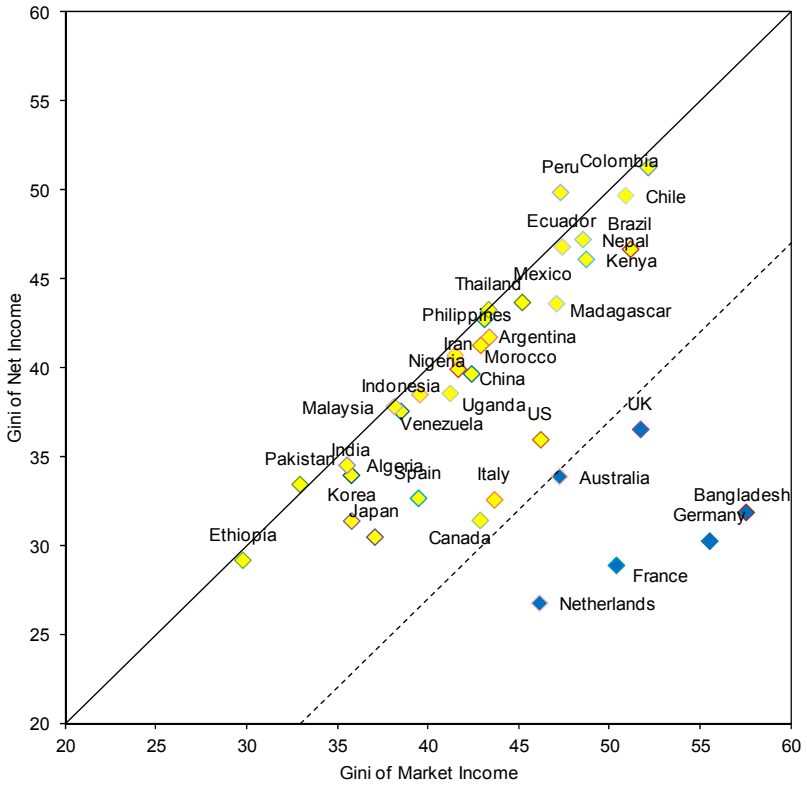
1/ The table reports results using the baseline sample and estimation of a proportional hazard model with time-varying covariates, which relates the probability that a growth spell will end to a variety of economic and political variables. A hazard ratio of 0.9 means that a unit change in the regressor decreases the expected time of duration by 10 percent; a hazard ratio of 1 means there is no effect; and a ratio of 1.1 means it increases expected duration by 10 percent. We test the probability that the true hazard ratio equals 1, and statistical significance at the 10, 5 and 1 percent level is indicated by *, **, ***, respectively.

[15] The p-value for the test that the two coefficients on redistribution in column 1 are equal is 0.095. If nonetheless we include redistribution only linearly (i.e. without a distinction between highly redistributive cases and others), we find an overall negative effect of redistribution on spell duration. As the baseline specification in column 1 shows, however, this is driven by the high-redistribution cases.

Our first main result, from the first column, is that inequality has a statistically significant negative relationship with the duration of growth spells. A one-Gini-point increase in inequality is associated with a 6 percentage point higher risk that the spell will end the next year (or, equivalently, with a decrease in expected spell length of about 7 percent). This echoes the results in Berg and Ostry (2011), but now controlling for redistribution.

Turning to redistribution, we find (also in column 1 of Table 5) that when redistribution is already high (above the 75th percentile), there is evidence that further redistribution is indeed harmful to growth, as the Okun "big trade-off" hypothesis would suggest. When it is below that level, however, there is no evidence that further redistribution has any effect on growth. Figure 7 shows redistribution for selected countries; further redistribution seems to start having a negative direct effect when it exceeds about 13 Gini points.

Figure 7. Redistribution: The top 25 percent and the bottom 75 percent

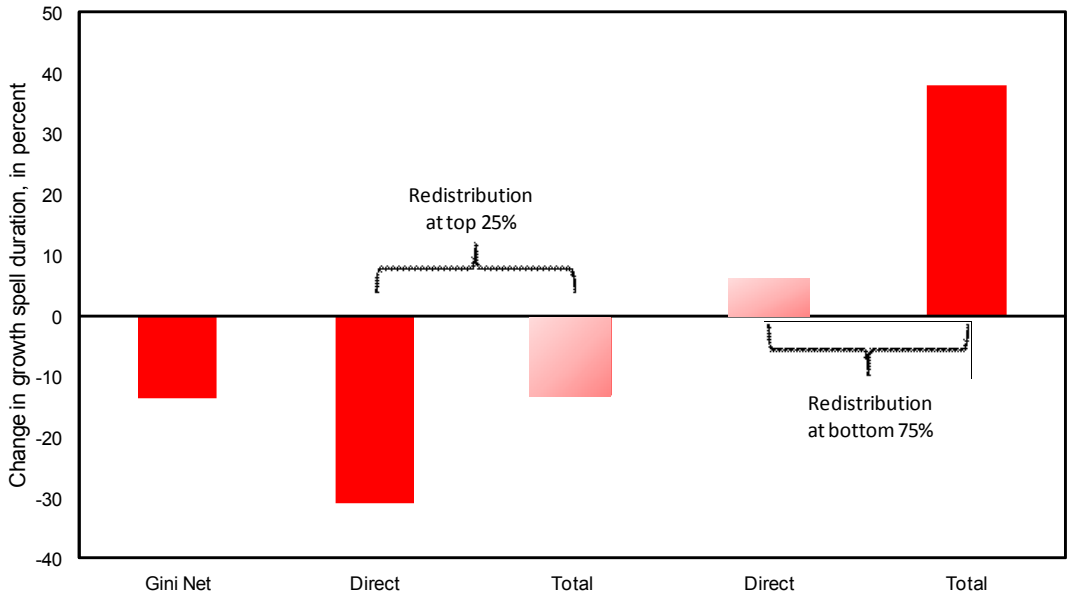


Source: Penn World Tables version 7.1, SWIID 3.1, and authors' calculations.
Note: The Gini coefficient for net income inequality is on the vertical axis, and the Gini for market income inequality is on the horizontal axis (both for the latest year data was available). For clarity, only the top 20 percent of countries by population are presented. The distance below the solid diagonal line represents the amount of redistribution. Countries below the dashed diagonal line are those in the top 25 percent of the distribution for redistribution. For a country exactly on that line, the difference between the market and net Gini values (the amount of redistribution) would be about 13 Gini points.

Thus, as with the growth regressions, we find that, contrary to the big trade-off hypothesis, the overall effect of redistribution is pro-growth, with the possible exception of extremely large redistributions. There is no negative direct effect, and the resulting lower inequality seems to

be associated with longer growth spells. For very large redistributions, the point estimate of the effect of redistribution on growth is negative and somewhat larger in absolute value than the estimated (positive) effect of inequality on growth, but this difference is statistically insignificant. This means that even in the case of large redistribution, there is little evidence of an overall adverse effect on growth, since the pro-equality and disincentive effects of the transfers roughly balance one another out. For smaller transfers, those of less than 13 Gini points, the evidence suggests that the overall effect of redistribution would be growth-positive: roughly neutral direct effects of redistribution, and a protective effect of the resulting reduction in inequality (Figure 8 presents these results graphically).

Figure 8. The effect of inequality and redistribution on growth spell duration



Source: Penn World Tables version 7.1, SWIID 3.1, and authors' calculations.
Note: This figure presents the results from Table 5, column 4. For redistribution, the height of the first column shows the percentage increase in spell duration resulting from an increase in redistribution from 75th to the 85th percentile, with all other variables at their median values. For the other variables, the height of the associated column shows the percentage increase in spell duration resulting from an increase in that variable from the 50th to the 60th percentile, with other variables at their median values. The lighter shade of the third and fourth columns reflects the fact that these effects are imprecisely estimated and are not significantly different from zero.

Columns 2–4 of Table 5 present similar results, but this time controlling for a number of potential determinants (such as physical investment, education, and institutions). Again, we find that the controls preserve the results related to inequality. The results with respect to redistribution are more fragile. In particular, the negative effect of very large transfers seems to disappear when certain other factors are controlled for, such as exogenous shocks, institutions, debt liabilities and openness (Column 4).

While we cannot show all possible combinations, we conclude that, as with the growth regressions above, the result on inequality is fairly robust: it seems to stick more or less independently of the covariates included in the model; the significant negative effect we find for large redistributions is not robust, however.

The scarcity of data we observed with respect to growth is even more acute here. This is not surprising: to analyze the duration of a growth spell, we need to observe its beginning and follow for at least several years. This puts a premium on long time series and thus the use of older data. In Table 6 we look at our benchmark spells regression (column 1 of Table 5), but now for the three samples we discussed above. We can see that, as with the growth regressions, the full sample results follow the baseline. Unlike the growth regressions, in the more restricted sample, which differs in eliminating from consideration the data from pre-1985 developing countries, the data are uninformative for spells (and *a fortiori* for the most restricted sample).

Table 6. Alternative samples: inequality, redistribution, and the duration of growth spells 1/

	Dependent Variable: Growth spell duration		
	Baseline	Full	Restricted
	(2)	(1)	(3)
Net inequality	1.060**	1.052**	1.064
	(0.0266)	(0.0252)	(0.0751)
Redistribution x Top 25th percentile	1.098***	1.082***	0.981
	(0.0322)	(0.0302)	(0.1097)
Redistribution x Bottom 75th percentile	0.987	1.007	0.999
	(0.0690)	(0.0658)	(0.1623)
Log(initial income)	1.024	1.032	1.085
	(0.0318)	(0.0301)	(0.0797)
Number of observations	640	801	364
Number of total spells / number of complete spells	62/28	77/31	31/8

Source: Penn World Tables version 7.1, SWIID 3.1, and authors' calculations.

1/ The table reports results using the full, baseline, and restricted samples and estimation of a proportional hazard model with time-varying covariates, which relates the probability that a growth spell will end to a variety of economic and political variables. A hazard ratio of 0.9 means that a unit change in the regressor decreases the expected time of failure by 10 percent; a hazard ratio of 1 means there is no effect; and a ratio of 1.1 means it increases expected duration by 10 percent. We test the probability that the true hazard ratio equals 1, and statistical significance at the 10, 5 and 1 percent level is indicated by *, **, ***, respectively.

V. CONCLUSION

We have taken advantage of a new comprehensive data set to look at the relationship between inequality, redistribution, and growth; earlier work on the inequality-growth relationship has generally confounded the effects of redistribution and inequality. Our focus has been on the medium and long term, both growth over five-year periods and the duration of growth spells. Several important conclusions emerge.

First, inequality continues to be a robust and powerful determinant both of the pace of medium-term growth and of the duration of growth spells, even controlling for the size of redistributive transfers. Thus, the conclusions from Berg and Ostry (2011) would seem to be robust, even strengthened. It would still be a mistake to focus on growth and let inequality take care of itself, not only because inequality may be ethically undesirable but also because the resulting growth may be low and unsustainable.

And second, there is surprisingly little evidence for the growth-destroying effects of fiscal redistribution at a macroeconomic level. We do find some mixed evidence that very large redistributions may have direct negative effects on growth duration, such that the overall effect—including the positive effect on growth through lower inequality—may be roughly growth-neutral. But for non-extreme redistributions, there is no evidence of any adverse direct effect. The average redistribution, and the associated reduction in inequality, is thus associated with higher and more durable growth.

We need to be mindful about over-interpreting these results, especially for policy purposes. It is hard to go from these sorts of correlations to firm statements about causality. We have not accounted for the possible effects that redistribution may have on market inequality. We have emphasized the uncertainty caused by the scarcity of reliable data, particularly about redistribution. Our measure of redistribution captures only direct taxes and subsidies, for example, so we shed no direct light on the redistributive effects of in-kind government provision of health and education which *a priori* would seem, if anything, to be more growth-friendly than the measures we account for. Finally, we know from history and first principles that after some point redistribution will be destructive to growth, and that beyond some point extreme equality also cannot be conducive to growth.

We nonetheless see an important positive conclusion from our look at the big picture. Extreme caution about redistribution—and thus inaction—is unlikely to be appropriate in many cases. On average, across countries and over time, the things that governments have typically done to redistribute do not seem to have led to bad growth outcomes, unless they were extreme. And the resulting narrowing of inequality helped support faster and more durable growth, apart from ethical, political, or broader social considerations.

This leaves a large research and policy agenda. Even given these results about average effects, it remains important to try to make redistribution as efficient as possible. And further insight into the mechanisms at play would help sharpen our understanding and policy recommendations. Our results here highlight the urgency of this agenda.

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