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Redistribution, inequality, and growth revisited

Comment on 'Redistribution, inequality, and growth: new evidence'

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Abstract: An influential paper by Berg et al., 'Redistribution, inequality, and growth: new evidence', uses the SWIID data to examine the impact of inequality and redistribution on growth in both developing and developed countries. It finds that while inequality is harmful for growth, redistribution does not hamper growth. This comment demonstrates that the redistribution and inequality data the paper uses are not credible. They are largely based on imputations, not actual observations. That is why one cannot really examine the research question for most of the countries in their sample, especially developing countries. Replicating their analysis on data not based on imputations—from the WIID dataset—changes some of the conclusions. In particular, inequality does not seem to lead to lower growth.

Key words: growth, redistribution, inequality, cross-country analysis

JEL classification: O11, O15, O40

Note: Tables 3 and 4 are at the end, after the reference list.

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1 Introduction

What is the relationship between economic growth, income inequality, and redistribution? Many researchers have used cross-country time-series data to examine both how redistribution is affected by growth and inequality, and, at least as importantly, how growth is affected by inequality and redistribution. Earlier studies have reached divergent conclusions. A recent influential paper by Berg et al. (2018) has garnered much attention. Using a combination of estimation methods and more abundant, newly available data, it found that lower inequality is associated with higher growth, while (a non-extreme level of) income redistribution does not appear to affect growth negatively. Berg et al. (2018) use data put together by Solt (2016)—the Standardized World Income Inequality Database (SWIID)—to analyze the impact of net (i.e. of taxes and transfers) inequality and redistribution (the difference between market and net inequality) on growth. The study and its working paper version (Ostry et al. 2014) have been very influential, both among researchers and in the media. It has gathered more than one thousand citations in Google Scholar and its media coverage has been extensive.[1]

Our comment challenges the key conclusions of the paper. We demonstrate that the data Berg et al. use does not really credibly and robustly support their findings. The main reason is that the SWIID data is not only based on real observations but also on imputations. This means that Berg et al. cannot really carry out their analysis for developing countries. Second, when we use data that only have real observations, from an alternative dataset—the World Income Inequality Database (WIID)—some of the results in Berg et al. change. In particular, it appears that net inequality does not influence growth negatively, at least not robustly.

We will critically discuss the data that the authors use in the next section (Section 2). We then present our replications of their analyses with an alternative dataset (WIID) in Section 3. Section 4 concludes.

2 Problems in the SWIID

The dataset on which the main analysis in Berg et al. (2018) is based comes from the SWIID—see Solt (2009, 2016). In the SWIID, missing observations are imputed. The imputations use information either from the country itself or from other countries in the same decade, or even from other countries from other decades.

Poverty and inequality data in developing countries are based on household surveys, which are not gathered every year, but rather once in a five- or ten-year period. In addition, inequality often refers to consumption inequality, especially in Asia and Africa, whereas information on both pre-tax, post-tax, and transfer income inequality is missing. Therefore, for most developing countries, actual redistribution is only rarely measured—see also Jäntti et al. (2020). This means that for most developing countries, the observations in the SWIID are based on imputations rather than real data.

Jenkins (2015) has criticized the SWIID data and comes to the conclusion that the dataset does not provide credible information. He recommends using the WIID data from UNU-WIDER instead. Because of the imputations, the data should be used with explicit recognition of the measurement error, which Berg et al. do, but only in their Table 5.

[1] The working paper version was discussed in *The Guardian, The Economist, The New York Times*, and the *Financial Times*, among others.

A very large part of the analysis in Berg et al. (2018) is based on data that are, in our view also, not credible. Their work on panel growth regressions (Section 4) is based on a five-year panel (SDN_5year_average_dataset), which we scrutinize in this section. Their work on survival analysis and growth spells (Section 5) is based on similar data. In that respect, our critical remarks are also relevant for that section. Only in the electronic supplementary material (Table 2.1) do they work with better data; we attend to these regressions below as well. While Solt (2015) replies to the criticism presented by Jenkins (2015), and later versions of the SWIID have been developed further, the fact remains that the data used in Berg et al. (2018) are largely based on imputations and turn out to be suspect, as we demonstrate below.

In Table 1, we have collected some countries from their 5-year average dataset for which we think the observations used are clearly unreasonable. The data imply that many very poor developing countries have had extensive social safety nets for many decades, which we find implausible. The upshot is not only that the SWIID data do not contain measurement error, but that many observations are just not plausible.

Table 1: Odd observations: observed redistribution in selected cases in the SWIID data used in Berg et al.

Bangladesh:	was 0 in 2000, increased to 23 in 2010
Botswana:	was 16 in 1975, dropped to 2 in 1990
Brazil:	was 27 in 1970, dropped to around 5 in 1985
Costa Rica:	was 12 in 1965, dropped to 1 in 2010
El Salvador:	was 17 in 1965, dropped to 1 in 2010
Gabon:	was 16 in 1960, dropped to 3 in 1975
Honduras:	was 13 in 1970, dropped to 2 in 2010
India:	was 12 in 1960, dropped to 1 in 1985
Kenya:	was 12 in 1980, dropped to 3 in 2000
Malawi:	was 24 in 1980, dropped to 1 in 2005
Mauritius:	was 16 in 1975, dropped to 0 in 2010
Peru:	was 14 in 1965, dropped to -0.3 in 2010
Uruguay:	was 20 in 1970 but 0 in 1980
Pakistan:	was 18 in 1970, dropped to 0 in 2000
Senegal:	was 18 in 1960, dropped to 1 in 2000
Sierra Leone:	was 17 in 1970, dropped to 2 in 2000
Tanzania:	was 18 in 1970, dropped to 1 in 2005
Thailand:	was 13 in 1965, dropped to 1 in 1990
Zambia:	was 16 in 1965, dropped to 0 in 2005

Source: authors' compilation.

An alternative dataset would be the WIID (WIID4 version) from UNU-WIDER (2018), which is an extensive collection of inequality indices from all over the world, and which does not rely on imputations. In the appendix, we explain how we constructed the dataset on inequality and redistribution from the WIID. We obtain only 143 observations for the main analysis, instead of the 828 observations in the original study (Table 2 in Berg et al.). This implies that the vast majority of the observations in the SWIID sample are not real.

Table 2 offers a breakdown of the sample by country groups in the SWIID versus in the WIID. When moving from the SWIID to the WIID, the number of observations drops, for the developing countries in particular. Therefore, it appears that the data that would be required for the analysis in Berg et al. are simply not available, especially for developing countries.

Table 2: Observations regarding redistribution (the variable 'redist_baseline') in 5-year average data

	1956–1960		1961–1970		1971–1980		1981–1990		1991–2000		2001–2010	
	SWIID	WIID	SWIID	WIID	SWIID	WIID	SWIID	WIID	SWIID	WIID	SWIID	WIID
Africa	2	0	24	1	31	2	37	0	57	0	34	0
Americas	3	0	31	0	32	1	42	2	56	5	44	13
Asia	1	0	24	1	25	0	29	3	42	5	37	6
Europe	2	0	28	0	36	3	39	17	65	24	71	49
Oceania	1	0	5	0	5	0	6	3	6	4	4	4

Note: data used for Table 2 in Berg et al.

Source: authors' compilation.

3 Replication of growth regressions using WIID data

Using the replication files available on the journal web page, we have conducted the same analysis as in Table 2 in Berg et al. (2018)—our Table 3, at the end of this paper. Three sets of results are presented. They all use the code and the econometric specification as in Berg et al. (2018). The first set also uses their data, and we are able to recreate their estimates.[2] The second estimates use the SWIID data, but only the country-year observations that we can also observe in the WIID data. Third, we estimate the models with the original code and the alternative WIID data. The numbers in the column headings refer to the column numbers in their Table 2 (we have not reproduced their Column 2, which estimates non-linear effects of net inequality).

The first point to note about the results is the large drop in the number of both observations and countries when moving from the SWIID to the WIID. Second, even if one has the same observations, but different datasets (such as between the second and third columns of the baseline estimates in Table 3), the results typically differ. Third, in most specifications with the WIID data, net inequality does not significantly affect economic growth negatively. Lastly, in the model with controls (our Columns 4–6, corresponding to the original 3), using WIID data suggests that lower net inequality reduces growth, but that redistribution also statistically significantly does so. This is, in part, due to the move from the full set of countries available in the SWIID (130 countries) to only those countries that are observed in the WIID (48 countries). The point estimate on redistribution goes from a positive 0.0270 to a negative -0.0236, but is statistically insignificant in both cases. Once we use WIID data, the coefficient drops to a much (in absolute magnitude) smaller but statistically significant -0.00197.

We would not necessarily interpret the final finding too strongly, since in most specifications, redistribution is insignificant. But the fact that the results regarding net inequality change so drastically imply that the results in the original paper are not really robust and depend on the questionable data used.

Berg et al. (2018) also conduct their analysis using more restricted datasets (their Table 2.1 in the electronic supplementary material). We think this is a useful addition to their paper. In these more restricted samples, many of the suspect observations are dropped from the analysis. We have estimated three sets of results, mimicking them when possible. They are shown in Table 4, at the end of this paper: Panel A reproduces their estimates, Panel B shows results of their models with SWIID data, but restricted to the observations that are included in the WIID, and Panel C uses only the WIID data (we are only able to reproduce a subset of the models available in Panels A and B).

When we replicate their Table 2.1 (in their supplementary material) using either the original SWIID data, but for countries and periods for which we can have observations in the WIID (Panel B), or using the

[2] The replication was facilitated by the provision of data and do-files by the authors.

WIID data (Panel C) for the most restricted sample—namely the 24 countries that in 1975 belonged to the OECD (the last four columns in each of the three panels)—the results about the effects of inequality and redistribution on growth turn out not to be robust. Once we restrict the sample to countries and periods for which actual data in the WIID are available, rather than the imputed data in SWIID, but use SWIID in estimations, the main result—that inequality reduces growth while redistribution does not affect it—no longer holds, except in one case (their 'Very restricted' sample with full controls, Column 12 in Panel B of Table 4. We are unable to estimate their 'Restricted' and 'Very restricted' samples using WIID data due to scarceness of data, but using the OECD 24 and WIID data (Panel C, Columns 5–8), the results are different from either their results or for those we obtain restricting the observations to those available in the WIID (Panels A and B, Columns 13–16). Indeed, only two coefficient estimates in Panel B and C are statistically significant, and the signs vary across panels and columns.

4 Concluding comments

Our note made two points. First, the data used in the analysis by Berg et al. (2018) are based, to a large extent, on imputations. These imputations result in observations that are clearly not plausible. Hence, even if one wanted to carry out analysis on the connections between redistribution and growth, such research would be seriously hampered by the lack of data outside of developed countries, . This lack of data is understandable, since the distributional indices are typically expressed in the consumption space, not before-and-after tax income space, in developing countries. Second, when replicating the paper's analysis with data that is not based on imputations, some of the results change.

The SWIID data have been used in a great number of research articles. The article introducing the dataset (Solt 2016) has been cited more than one thousand times in Google Scholar. Our point about being very careful with the cross-country inequality data one uses has, therefore, broader implications going well beyond the study scrutinized in this comment.

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Table 3: Replication of Table 2 in Berg et al. (2018)—regression of five-year economic growth on net inequality and redistribution

	Baseline (BL)	BL with WIID observations	BL, WIID	BL + ctrls (3)	BL + ctrls (3) with WIID obs.	BL + ctrls (3), WIID
Log(initial income)	-0.00693**	-0.0117	-0.0214*	-0.00802**	-0.0162*	-0.0116*
	(-2.03)	(-1.08)	(-1.93)	(-2.31)	(-1.80)	(-1.76)
Net inequality	-0.00143***	-0.00164**	-0.00125	-0.000895***	-0.000457	-0.000888*
	(-3.23)	(-2.48)	(-1.26)	(-2.60)	(-0.44)	(-1.70)
Redistribution	0.00464	-0.0778	-0.000874	0.0270	-0.0236	-0.00197**
	(0.09)	(-0.93)	(-1.32)	(0.49)	(-0.25)	(-2.43)
Log(investment)				0.0239***	0.0378*	0.0127
				(3.15)	(1.79)	(0.47)
Log(population growth)				-0.0158	-0.0633	-0.0447
				(-0.87)	(-1.50)	(-1.36)
Log(total education)						
Large negative terms of trade shock						
Political institutions						
Openness						
Debt liabilities						
Constant	0.136***	0.208*	0.297**	0.0811*	0.199	0.243
	(3.41)	(1.96)	(2.17)	(1.78)	(1.37)	(1.63)
Observations	828	143	143	828	143	143
Number of countries	130	48	48	130	48	48
Sargan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hansen	0.0826	0.9952	0.9946	0.1197	1.0000	0.9985
AR1	0.0000	0.0565	0.0736	0.0000	0.0386	0.0552
AR2	0.1639	0.9599	0.9480	0.1197	0.7594	0.7905
Number of instruments	117	95	74	133	101	84
longtable						

Continued (next page)

Table 3 *continued*

	BL + ctrls (4)	BL + ctrls (4) with WIID obs.	BL + ctrls (4), WIID	BL + ctrls (5)	BL + ctrls (5) with WIID obs.	BL + ctrls (5), WIID
Log(initial income)	-0.0141***	-0.0153	-0.0123	-0.0128**	-0.0114	-0.0218
	(-3.68)	(-1.55)	(-1.24)	(-2.38)	(-0.80)	(-1.31)
Net inequality	-0.000685**	-0.000335	-0.0000242	-0.00102**	0.000567	-0.000399
	(-2.41)	(-0.36)	(-0.03)	(-2.12)	(0.53)	(-0.21)
Redistribution	0.00802	-0.0202	-0.00150**	0.0427	0.0484	-0.000716
	(0.21)	(-0.17)	(-2.26)	(0.70)	(0.80)	(-0.49)
Log(investment)	0.0251***	0.0312**	0.0121	0.00720	0.0216	0.0390
	(2.88)	(2.52)	(0.80)	(0.58)	(1.51)	(1.15)
Log(population growth)	-0.0202	-0.0513	-0.0713*	-0.00585	0.0105	-0.0129
	(-1.16)	(-1.55)	(-1.71)	(-0.38)	(0.18)	(-0.12)
Log(total education)	0.0221***	0.00919	0.0355	0.0180**	-0.00616	0.0211
	(2.82)	(0.76)	(1.56)	(2.09)	(-0.26)	(0.41)
Large negative terms of trade shock				-0.0415**	-0.0225	-0.00929
				(-2.38)	(-1.49)	(-0.26)
Political institutions				-0.00126*	0.00576	0.00484*
				(-1.65)	(0.90)	(1.80)
Openness				0.00996	0.0342	0.0275
				(0.85)	(1.43)	(1.32)
Debt liabilities				-0.0179***	-0.00917*	-0.00953
				(-2.92)	(-1.90)	(-0.89)
Constant	0.0875**	0.164*	0.183**	0.151***	-0.0195	0.0707
	(2.27)	(1.80)	(2.25)	(2.68)	(-0.13)	(0.53)
Observations	751	141	141	558	114	114
Number of countries	110	47	47	79	36	36
Sargan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Hansen	0.6523	0.9995	0.9999	0.4492	0.9998	0.9988
AR1	0.0000	0.0489	0.0804	0.0000	0.0307	0.1206
AR2	0.1851	0.7964	0.9253	0.5229	0.5505	0.5263
Number of instruments	139	103	89	100	84	72

Note: t statistics in parentheses. System GMM estimation with time period dummies and Windmeijer's finite-sample corrected standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Source: authors' compilation.

Table 4: Replication of alternative samples: Table 2.1 in Berg et al.'s electronic supplementary material—'The Effect of Inequality and Redistribution on Growth'

Panel A. SWIID sample

	(1) Baseline	(2)	(3)	(4)	(5) Restricted (3)	(6)	(7)	(8)	(9) Very restricted	(10)	(11)	(12)	(13) OECD 24	(14)	(15)	(16)
Log(initial income)	-0.0069**	-0.0081**	-0.0140***	-0.0135***	-0.0211**	-0.0226***	-0.0260***	-0.0245***	-0.0144**	-0.0184**	-0.0251***	-0.0272***	-0.0832***	-0.1109***	-0.1304***	-0.1253***
	(0.0034)	(0.0035)	(0.0037)	(0.0046)	(0.0098)	(0.0073)	(0.0072)	(0.0072)	(0.0062)	(0.0078)	(0.0068)	(0.0069)	(0.0270)	(0.0247)	(0.0230)	(0.0261)
Gini of net income	-0.1435***	-0.0914***	-0.0739***	-0.1057**	-0.3083***	-0.2440**	-0.1350**	-0.1269*	-0.2102***	-0.2082**	-0.1709*	-0.1425**	-0.3107**	-0.2887**	-0.3378*	-0.2142
	(0.0444)	(0.0337)	(0.0266)	(0.0492)	(0.0600)	(0.0970)	(0.0663)	(0.0648)	(0.0717)	(0.0969)	(0.0970)	(0.0668)	(0.1538)	(0.1407)	(0.1804)	(0.1466)
Redistribution	0.0046	0.0258	0.0109	0.0530	-0.0103	0.0264	0.0194	0.0047	-0.0384	-0.0359	-0.0171	-0.0022	0.0070	-0.0215	0.0255	0.1267
	(0.0492)	(0.0516)	(0.0428)	(0.0494)	(0.1404)	(0.1073)	(0.0640)	(0.0602)	(0.0927)	(0.1042)	(0.0732)	(0.0832)	(0.0994)	(0.0926)	(0.1059)	(0.2333)
Log(investment)		0.0241***	0.0250***	0.0076		0.0249	0.0343*	-0.0071		0.0603***	0.0680***	0.0387*		0.0236	0.0219	0.0142
		(0.0078)	(0.0084)	(0.0125)		(0.0168)	(0.0189)	(0.0206)		(0.0226)	(0.0105)	(0.0207)		(0.0351)	(0.0193)	(0.0369)
Log(population growth)		-0.0159	-0.0215	-0.0084		-0.0549	0.0086	-0.0338		-0.0742**	-0.0634***	-0.0923**		-0.0177	0.0167	0.0278
		(0.0182)	(0.0174)	(0.0160)		(0.0378)	(0.0288)	(0.0576)		(0.0326)	(0.0241)	(0.0365)		(0.0443)	(0.0505)	(0.0780)
Log(total education)			0.0206***	0.0164*			0.0433***	0.0357			0.0181	0.0116			0.0132	0.0141
			(0.0073)	(0.0099)			(0.0146)	(0.0249)			(0.0165)	(0.0201)			(0.0338)	(0.0316)
Large negative terms of trade shock				-0.0424***				-0.0505**				-0.0255				-0.0460
				(0.0158)				(0.0213)				(0.0161)				(0.0329)
Political institutions				-0.0011				0.0002				0.0000				-0.0003
				(0.0008)				(0.0013)				(0.0009)				(0.0008)
Openness				0.0091				0.0206*				0.0269***				0.0700
				(0.0082)				(0.0106)				(0.0095)				(0.0545)
Debt liabilities				-0.0198***				-0.0100				-0.0091				-0.0074
				(0.0059)				(0.0063)				(0.0073)				(0.0064)
Constant	0.1390***	0.0807*	0.0965**	0.0000	0.0000	0.3390***	0.0000	0.0000	0.0000	0.0000	0.0000	0.3470***	0.8888***	1.0991***	1.2143***	0.0000
	(0.0408)	(0.0464)	(0.0405)	(.)	(.)	(0.0896)	(.)	(.)	(.)	(.)	(.)	(0.1246)	(0.2702)	(0.3431)	(0.3039)	(.)
Observations	828	828	751	558	462	462	426	341	334	334	320	255	220	220	220	182
Countries	130	130	110	79	85	85	76	56	80	80	72	53	24	24	24	22
InstrumNo	117	133	139	100	76	63	87	66	67	69	91	78	36	38	25	31
Sargan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0067	0.7480	0.3220	0.6205	0.4701
Hansen	0.0826	0.1232	0.6588	0.4942	0.0236	0.0013	0.0836	0.0174	0.0080	0.0094	0.4533	0.8109	0.9892	0.9884	0.9916	0.9782
AR1	0.0000	0.0000	0.0000	0.0000	0.0005	0.0010	0.0006	0.0001	0.0012	0.0147	0.0111	0.0018	0.0256	0.0360	0.0375	0.0363
AR2	0.1639	0.1204	0.1818	0.4780	0.1112	0.1402	0.1385	0.4139	0.1464	0.1224	0.1014	0.8606	0.3153	0.2372	0.1828	0.1070
Difference-in-Hansen tests of exogeneity of instrument subsets																
GMM instruments for levels: Hansen test excluding the group	0.0036	0.0032	0.0003	0.0002	0.0041	0.0000	0.0001	.	0.0014	0.0035	0.0151	0.0037	0.9734	0.9379	0.9750	0.8362
Difference test (null H = exogenous)	0.9618	0.9967	1.0000	0.9996	0.8221	0.8560	0.9998	0.8008	0.6436	0.4298	1.0000	1.0000	1.0000	0.9999	1.0000	0.9731
GMM instruments for diff eq. with initial income: Hansen test excluding the group	0.0022	0.0820	0.3747	0.2757	0.0001	0.0001	0.0010	0.0023	0.0019	0.0025	0.2259	0.0513	0.2274	0.7293	0.9851	0.9708
Difference test (null H = exogenous)	0.9849	0.6980	1.0000	0.9896	0.9608	0.6391	0.9999	0.9755	0.8326	0.8146	0.9999	1.0000	0.9978	0.9813	0.8485	0.6667
GMM instruments for diff eq. with controls 1: Hansen test excluding the group	0.0349	0.0023	0.0110	0.0106	0.0002	0.0000	0.0006	0.0001	0.0014	0.0035	0.0000	0.0009	0.9947	0.9997	0.9789	0.8362
Difference test (null H = exogenous)	0.4978	0.7434	1.0000	0.9999	0.8943	0.6792	0.9946	0.8870	0.6436	0.4298	0.9991	1.0000	0.3497	0.2409	0.8182	0.9731
GMM instruments for diff eq. with controls 2: Hansen test excluding the group	.	.	.	.	.	.	.	.			.	.	0.9473	.	.	
Difference test (null H = exogenous)	.	.	.	.	.	.	.	.			.	.	1.0000	.	.	
GMM instruments for level eq. with controls 1: Hansen test excluding the group	0.0036	0.0032	0.0003	0.0002	0.0041	0.0000	0.0001	.			0.0151	0.0037	0.9829	0.9722	0.8313	
Difference test (null H = exogenous)	0.9618	0.9967	1.0000	0.9996	0.8221	0.8560	0.9998	0.8008			1.0000	1.0000	1.0000	0.9890	0.9901	
GMM instruments for level eq. with controls 2: Hansen test excluding the group	.	.	.	.	.	.	.	.			.	.	0.9829	0.9718	.	
Difference test (null H = exogenous)	.	.	.	.	.	.	.	.			.	.	1.0000	1.0000	.	
GMM instruments for instruments: Hansen test excluding the group	0.0406	0.0788	0.6166	0.0813	0.0075	0.0003	0.0276	0.0010			0.1527	0.1923	0.6525	0.6910	0.8932	
Difference test (null H = exogenous)	0.8245	0.7299	0.6092	1.0000	0.8730	0.6962	0.9815	1.0000			1.0000	1.0000	1.0000	0.9999	0.9678	
chi-square test for gini=redist																
p-value																

Continued (next page)

Table 4 *continued*

Panel B. SWIID data but WIID observations

	(1) Baseline	(2)	(3)	(4)	(5) Restricted (3)	(6)	(7)	(8)	(9) Very restricted	(10)	(11)	(12)	(13) OECD 24	(14)	(15)	(16)
Log(initial income)	-0.0121*	-0.0107	-0.0128	-0.0168	-0.0385***	0.0026	-0.0361***	-0.0114	-0.0335***	-0.0303**	-0.0325**	-0.0478	-0.0285	-0.0538	-0.0800	-0.1402
	(0.0069)	(0.0117)	(0.0102)	(0.0142)	(0.0118)	(1.1303)	(0.0103)	(0.1193)	(0.0103)	(0.0148)	(0.0155)	(0.0344)	(0.0390)	(0.0477)	(0.0762)	(0.1469)
Gini of net income	-0.1810**	0.0176	-0.0454	0.0141	-0.0270	0.0000	0.0337	-0.0137	0.1267	0.0556	0.0736	-0.2191*	0.0748	0.0918	0.1506	0.0222
	(0.0714)	(0.0826)	(0.1087)	(0.1086)	(0.1062)	(.)	(0.0945)	(1.1594)	(0.1662)	(0.2326)	(0.1347)	(0.1292)	(0.1614)	(0.1920)	(0.2025)	(0.6944)
Redistribution	-0.0912	0.0275	-0.0286	0.0289	0.0793	0.0037	0.1800*	-0.0121	0.1779	0.0430	0.1315	0.1108	0.0933	0.1169	0.1274	-0.1591
	(0.0665)	(0.0532)	(0.1261)	(0.0999)	(0.1377)	(51.6872)	(0.0976)	(1.1939)	(0.1742)	(0.2196)	(0.1281)	(0.3641)	(0.1223)	(0.1643)	(0.1653)	(0.3122)
Log(investment)		0.0362**	0.0225*	0.0244		0.0000	0.0616**	0.0308		0.0239	0.0514*	0.0424		0.0259	0.0234	0.0285
		(0.0154)	(0.0129)	(0.0151)		(.)	(0.0248)	(0.1563)		(0.0250)	(0.0285)	(0.0262)		(0.0289)	(0.0309)	(0.0412)
Log(population growth)		-0.0762	-0.0613*	-0.0226		0.0000	-0.0332	-0.0160		-0.0341	-0.0476	-0.0280		-0.0045	-0.0339	-0.1030
		(0.0507)	(0.0313)	(0.0462)		(.)	(0.0560)	(0.8096)		(0.0570)	(0.0316)	(0.0970)		(0.0480)	(0.0587)	(0.1735)
Log(total education)			0.0034	0.0185			0.0159	0.0056			0.0417**	0.0144			0.0138	-0.0181
			(0.0237)	(0.0368)			(0.0419)	(0.1249)			(0.0204)	(0.0381)			(0.0637)	(0.0970)
Large negative terms of trade shock				-0.0159				-0.0116				-0.0141				-0.0309
				(0.0173)				(0.2961)				(0.0173)				(0.0407)
Political institutions				0.0046**				0.0023				-0.0006				0.0216
				(0.0021)				(0.0360)				(0.0022)				(0.0483)
Openness				0.0249				0.0031				0.0169				0.1216*
				(0.0182)				(0.2283)				(0.0622)				(0.0734)
Debt liabilities				-0.0068				-0.0069				-0.0081				-0.0030
				(0.0052)				(0.0334)				(0.0410)				(0.0084)
Constant	0.1711***	0.0000	0.0000	0.0000	0.0000	0.0000	0.1821	0.0000	0.0000	0.0000	0.0000	0.4291	0.0000	0.0000	0.7189	0.0000
	(0.0639)	(.)	(.)	(.)	(.)	(.)	(0.1125)	(.)	(.)	(.)	(.)	(0.4193)	(.)	(.)	(0.7986)	(.)
Observations	142	142	140	113	134	134	134	109	106	106	106	88	98	98	98	93
Countries	47	47	46	35	43	43	43	33	38	38	38	28	23	23	23	21
InstrumNo	95	101	103	84	71	59	79	61	62	62	78	69	30	32	23	31
Sargan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0004	0.0011	0.2996	0.0007	0.0000	0.0073
Hansen	0.9988	0.9999	0.9999	0.9997	0.7027	0.0000	0.9480	0.8315	0.5966	0.4620	0.9756	1.0000	0.9445	0.4178	0.0270	0.8286
AR1	0.0686	0.0297	0.0462	0.0436	0.0520	0.9944	0.0835	0.7387	0.0361	0.0575	0.0639	0.0819	0.1543	0.1495	0.2103	0.5275
AR2	0.9730	0.7953	0.7860	0.4650	0.8214	0.9982	0.8790	0.8742	0.7371	0.6757	0.8892	0.2614	0.4516	0.5156	0.5138	0.6392
Difference-in-Hansen tests of exogeneity of instrument subsets																
GMM instruments for levels: Hansen test excluding the group	0.5770	0.6545	0.0389	0.1284	0.1116	0.0162	0.0275	0.4892	0.0721	0.2274	0.4438	0.4038	0.7050	0.2846	0.0165	0.5362
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	0.9979	1.0000	0.7965	1.0000	1.0000	1.0000	0.6735	0.4706	0.9140
GMM instruments for diff eq. with initial income: Hansen test excluding the group	0.3166	0.9904	0.9961	0.9958	0.0035	0.0017	0.2685	0.0050	0.2361	0.4282	0.9567	0.9995	0.9851	0.5124	0.0751	0.6107
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	0.9987	1.0000	0.0000	1.0000	1.0000	1.0000	0.4836	0.7967	0.9956	0.2270	0.2603	0.0585	1.0000
GMM instruments for diff eq. with controls 1: Hansen test excluding the group	0.6960	0.0211	0.6132	0.9879	0.0072	0.0000	0.1166	0.6063	0.0721	0.2274	0.0000	0.9029	0.9237	0.4464	0.0187	0.5362
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	0.9938	1.0000	0.0000	1.0000	0.9308	1.0000	0.7965	1.0000	1.0000	0.6437	0.2927	0.2651	0.9140
GMM instruments for diff eq. with controls 2: Hansen test excluding the group	.	.	.	.	.	.	.				.	.	.	.	.	
Difference test (null H = exogenous)	.	.	.	.	.	.	.				.	.	.	.	.	
GMM instruments for level eq. with controls 1: Hansen test excluding the group	0.5770	0.6545	0.0389	0.1284	0.1116	0.0162	0.0275				0.4438	0.4038	0.7720	0.4635	0.0011	
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000				1.0000	1.0000	1.0000	0.2622	0.7288	
GMM instruments for level eq. with controls 2: Hansen test excluding the group	.	.	.	.	.	.	.				.	.	0.9167	.	.	
Difference test (null H = exogenous)	.	.	.	.	.	.	.				.	.	1.0000	.	.	
GMM instruments for instruments: Hansen test excluding the group	0.9816	0.9962	0.9989	0.9975	0.4831	0.0821	0.8200				0.8201	0.9982	0.3742	0.1221	0.0065	
Difference test (null H = exogenous)	1.0000	1.0000	0.9968	0.9842	0.9597	0.0000	0.9988				1.0000	1.0000	1.0000	0.9061	0.2631	
chi-square test for gini=redist																
p-value																

Continued (next page)

Table 4 *continued*

Panel C. WIID data and WIID observations

	(1) Baseline	(2)	(3)	(4)	(5) OECD 24	(6)	(7)	(8)
Log(initial income)	-0.0195*	-0.0127	-0.0119	-0.0304	-0.0918***	-0.0520	-0.0212	-0.0935
	(0.0117)	(0.0086)	(0.0113)	(0.0230)	(0.0227)	(0.0500)	(0.0716)	(0.0853)
Gini of net income	-0.0745	-0.0614	-0.0712	-0.1785	-0.1567	0.0933	0.0264	-0.1751
	(0.1213)	(0.1366)	(0.1008)	(0.1526)	(0.2269)	(0.3181)	(0.2799)	(1.0959)
Redistribution	-0.0322	-0.1508	-0.1768	-0.0719	-0.2350	-0.0805	-0.0004	-0.0079
	(0.0822)	(0.1146)	(0.1150)	(0.0889)	(0.2161)	(0.1998)	(0.2432)	(1.4575)
Log(investment)		0.0085	-0.0082	0.0512*		0.0229	0.0291	0.0626
		(0.0291)	(0.0172)	(0.0285)		(0.0283)	(0.0299)	(0.3658)
Log(population growth)		-0.0784*	-0.0795*	0.0899		-0.0815	-0.1136	-0.0204
		(0.0401)	(0.0410)	(0.0818)		(0.0714)	(0.0742)	(0.3633)
Log(total education)			-0.0051	-0.0119			0.0083	0.0383
			(0.0372)	(0.0285)			(0.0428)	(0.2362)
Large negative terms of trade shock				-0.0273				-0.0491
				(0.0192)				(0.1643)
Political institutions				0.0097				0.0132
				(0.0093)				(0.0266)
Openness				0.0180				0.0405
				(0.0380)				(0.2360)
Debt liabilities				-0.0134**				-0.0050
				(0.0059)				(0.0132)
Constant	0.0000	0.0000	0.3513***	0.0051	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(0.1258)	(0.3431)	(.)	(.)	(.)	(.)
Observations	143	143	141	114	99	99	99	94
Countries	48	48	47	36	24	24	24	22
InstrumNo	74	83	89	72	26	28	22	29
Sargan	0.0000	0.0000	0.0000	0.0001	0.0692	0.0060	0.0000	0.3631
Hansen	0.9460	0.9955	0.9995	1.0000	0.5951	0.5041	0.0895	0.9473
AR1	0.0515	0.0570	0.0555	0.0572	0.0666	0.0498	0.0670	0.5313
AR2	0.6447	0.8748	0.8902	0.4501	0.5564	0.5966	0.5132	0.5336
Difference-in-Hansen tests of exogeneity of instrument subsets								
GMM instruments for levels: Hansen test excluding the group	0.2548	0.3992	0.0188	.	0.4638	0.2340	0.0462	0.4014
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	1.0000	0.7507	0.9056	0.8005	1.0000
GMM instruments for diff eq. with initial income: Hansen test excluding the group	0.2333	0.9456	0.9881	0.9986	0.4091	0.6103	0.0251	0.8158
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	1.0000	1.0000	0.2992	0.3856	1.0000
GMM instruments for diff eq. with controls 1: Hansen test excluding the group	0.2392	0.0269	0.3070	0.6274	0.4279	0.3326	0.0437	0.4014
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	1.0000	0.9101	0.9655	0.4072	1.0000
GMM instruments for diff eq. with controls 2: Hansen test excluding the group	.	.	.	.	.	.	.	
Difference test (null H = exogenous)	.	.	.	.	.	.	.	
GMM instruments for level eq. with controls 1: Hansen test excluding the group	0.2548	0.3992	0.0188	.	0.5592	0.2568	.	
Difference test (null H = exogenous)	1.0000	1.0000	1.0000	1.0000	0.4485	1.0000	0.5505	
GMM instruments for level eq. with controls 2: Hansen test excluding the group	.	.	.	.	0.5169	.	.	
Difference test (null H = exogenous)	.	.	.	.	0.7185	.	.	
GMM instruments for instruments: Hansen test excluding the group	0.9994	0.9963	0.9916	0.9852	0.1432	0.1265	.	
Difference test (null H = exogenous)	0.0470	0.6184	1.0000	1.0000	0.9325	0.8745	0.6996	
chi-square test for gini=redist p-value								

Note: standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: authors' compilation.

Appendix

Data cleaning

We use the WIID4 version of the WIID. Redistribution is defined as the difference between market income and net income Gini. Different income Ginis and consumption Gini are defined using the WIID variable 'resource_detailed' in the following manner:

- Market income Gini: 'resource detailed' has value "Market income"
- Net income Gini: "Income, net", "Monetary income, disposable (excluding property income)", or "Monetary income, net"
- Gross income Gini: "Income, gross" or "Monetary income, gross"

If market income Gini is missing and the country belongs to the low- or lower middle-income groups by the World Bank classification, we replace market income Gini by gross income Gini.

In the case of multiple country-year Gini observations for any of the Gini measures, we use the following criteria to pick the one we use. Proceeding step by step:

1. Use observation with equivalized equivalence scale, then others.
2. If still multiple observations, use observations with 'all' area coverage, then others.
3. If still multiple observations, take the average.

Estimation

Berg et al. (2018) sample covers 5-year periods starting from 1956–60 until 2006–10. The sample in which inequality and redistribution are based on the WIID covers 5-year periods from 1966–70 to 2006–10. The start of the sample is constrained by the existence of inequality estimates, and the end of the sample is constrained by the availability of other data.