

Within-Country Income Inequality in Multi-decade Scenarios

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Abstract

Scenarios exploring long-term social and environmental sustainability must consider the distribution of incomes, but the theoretical basis for creating scenarios of within-country income distributions is weak. However, a recent social and political theory, developed by Chakravorty, offers a conceptual model that can be used to create compelling scenario narratives for within-country income distributions in a wide range of political and regulatory regimes. In this paper we argue that by combining this qualitative theory with a quantitative political theory (Selectorate theory), it is possible to explain quantitative changes in income distributions. We test the model against available data and apply it to some stylized global scenarios under different types of regimes.

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Introduction

Long-term scenarios exploring the prospects for social and environmental sustainability must in some way take distributional issues into account. Between countries, differential income growth over several decades leads to profound differences in life opportunities and consumption patterns, while within-country income inequality can affect health and social cohesion (Wilkinson 2005) as well as consumption patterns and life opportunities. However, as Hillebrand (2008) points out, there is little empirical evidence for constructing long-term scenarios for within-country income distributions. Although an influential book (Firebaugh 2003) has purported to show that both within-country and between-country income inequality follows a classic “inverted-U” trajectory over time, in which inequality first rises and then falls, there is little evidence for such a view, as discussed below. Rather, because income inequality tends to be very stable within countries, the most common assumption is for within-country income inequality to remain constant in time (Hillebrand 2008). This is an unsatisfactory state of affairs for the developer of long-term sustainability scenarios, because, although income distributions may be stable for long periods of time, it is clear that they do change and, in spite of the difficulty in finding a “smoking gun” that explains income inequality in a wide range of countries and situations (Gustafsson and Johansson 1997), the suspicion remains that there are some elements of scenario narratives that ought to be related to changes in income distribution. While scenarios have been constructed that include within-country income distributions (Gallopín and Raskin 2002; Hughes and Hillebrand 2006), they are few and the motivation for choosing specific income distribution trajectories remains weak.

Coming from a somewhat different direction than most researchers of income distribution, Chakravorty (2006) has proposed a conceptual model of within-country income inequality change that is based on a concept of state regimes. While drawing on economic theory for insight, the model is socio-political in nature, and suggests that a major determinant of distributional outcomes is the ideological orientation of the state, whether extractive, redistributive, or reinvestment-oriented. The relevance of this theory – if it is correct – for scenario narratives of long-term futures is clear. State ideology is a factor in many long-term scenarios, and Chakravorty’s qualitative model can be applied within a scenario narrative development process.

In this paper we take Chakravorty's qualitative theory an additional step and quantify the relationship between state ideology and inequality. We accomplish this by combining Chakravorty's theory with the Selectorate theory of Bueno de Mesquita et al. (2003). In this combined model, a set of explanatory variables suggests itself, and proposing proxies for these variables, we test the model by regressing it on available data, and show that a significant part of the variation in income inequality between countries can be explained with a small number of variables suggested by the theory. Finally, we apply the model to some example scenarios.

Explanations of Inequality

There is over half a century of work on quantitative explanations of inequality, and a much longer one of qualitative explanations, as thinkers in the Classical traditions in both the East and West were much concerned with wealth and income disparities, their political ramifications, and their causes. The groundbreaking work of Simon Kuznets in the middle of the last century (Kuznets 1955) launched the modern analysis of income inequality, and since his seminal paper a great many researchers have contributed their insights. The overall trajectory of research findings, we argue in this section, is from Kuznets' original theory that inequality changes in a systematic way with development, to a more nuanced understanding that, while economic factors are important, political and social factors are just as important – and perhaps more important – determinants of within-country income distribution. In this section we first present the evidence against average income (that is, economic development) as an explanation of income distributions, and then briefly summarize recent work on social and political determinants of income inequality.

AVERAGE INCOME DOES NOT EXPLAIN INCOME DISTRIBUTION

The standard theory of income distribution before the advent of relatively high-quality and complete data sets (Deiningner and Squire 1996) was Kuznets' "inverted-U" hypothesis, wherein national inequality was predicted to first rise and then fall as income increased (Ahluwalia 1976; Kuznets 1955). However, when tested against more complete data sets in the mid-1990s, it was observed that income inequality in the United States had been increasing for some time and had begun to increase more recently in other OECD countries, while inequality in the "Asian Tigers" had not changed significantly despite rapidly rising incomes. As a consequence, Kuznets' theory was largely abandoned, although its central concern – the link between growth and inequality – has provided the point of departure for a copious literature (Deiningner and Squire 1998; Aghion, Caroli, and García-Peñalosa 1999; Forbes 2000; Galor 2000; Eicher and Turnovsky 2003). Kuznets' inverted-U has since been resuscitated in empirical studies (Barro 2000; Higgins and Williamson 2002; Firebaugh 2003; Chen 2007), and Firebaugh (2003) has used these results to argue that Kuznets' original hypothesis was correct, so that the future of income inequality both between and within nations can be explained and anticipated using an inverted-U model. However, the sources that Firebaugh uses to support his argument do not in fact provide strong evidence for the importance of an inverted-U pattern, as is pointed out in the sources themselves. For example, Barro (2000) observes a Kuznets curve as a comparatively unimportant residual effect once other more important variables have been controlled for, while Chen (2007) sees evidence for a Kuznets-like relationship in a regime-switching model, but the effect is moderated by other variables, including population size and economic openness.

TOWARD SOCIAL AND POLITICAL EXPLANATIONS OF INEQUALITY

Studies seeking to explain the observed rise in within-country inequality in the OECD initially focused upon skill-biased technological change: that is, new technologies created a greater demand for those skilled in the new technologies (Berman, Bound, and Griliches 1994; Acemoglu 1998; Autor, Katz, and Krueger 1998; Zeira 2007). While always contested (Fishlow and Parker 1999; Galbraith and Berner 2001), this market-oriented theory has also been challenged by evidence that political and social institutions matter more for distributional outcomes than do changes in labor markets. Persson and Tabellini (1994) and Alesina and Rodrik (1994) examined the connection between economic growth and income distribution in democracies. Although they considered purely economic variables, their theoretical frameworks assume a political causal chain, in which distribution influences the tax and regulatory environment. This general approach was given a sounder empirical and theoretical basis in the work of Bénabou (2000), who identified divergent steady-state outcomes that resemble the political and distributional environments of the United States and Western Europe. More recently, Brandolini and Smeeding (2007) found that among Western-style democracies, tax and redistribution policies are important determinants of income distribution. Similar results have been observed in the particular case of the United States (Piketty and Saez 2003; Levy and Temin 2007). Examining data for both industrialized and developing countries, Chong and Gradstein (2007) find that distributional outcomes can be partly explained by the quality of institutions, using different measures of institutional quality. Finally, in a study of pre-industrial societies, Milanovic, Lindert, and Williamson (2007) found the extractive tendencies of the political elite to be an important determinant of inequality outcomes. These results suggest that institutions are potentially more important for understanding income inequality than the market forces that underlay Kuznets' argument and the hypothesis of skill-biased technological change.

Other studies have argued for a link between institutions and inequality, but one in which the causality runs the other way: initial inequality in income or physical endowments affects later institutional outcomes. Easterly (2007) argues that agricultural endowments predict inequality, which in turn affects institutional quality and schooling, and Bourguignon and Verdier (2000) propose a theoretical model in which initial income and inequalities lead to divergent outcomes for political institutions, income distribution, and growth.

While it is undeniable that labor markets play an essential role in shaping income distributions, the studies listed above suggest strongly that market forces cannot account for most of the variation in within-country income distribution across countries.

FRAGMENTS OF INEQUALITY

Approaching the subject from a different direction than the dominant economically-oriented ones, Chakravorty (2006) presents a model of within-country income inequality change that draws on economics, social science, and geography as well as a model of international income distribution based in part on the relatively recent "spatial" economic theories. The model in this paper does not examine the spatial dimension of inequality, and so does not incorporate that component of Chakravorty's theory. [For an analysis of spatial aspects of inequality, with a caution regarding the state of the international database, see (Novotný 2007)]. Focusing on the elements of most relevance to this paper, Chakravorty's model has the following features.

Part of the present distribution of inequality is determined by non-reproducible and country-specific historical facts, such as the pattern of colonization [see also (Angeles 2007), for a discussion of the

evidence for a link between colonization and inequality]. Aside from historical factors, social levels of inequality are determined primarily by the ideology of the state, whether oriented toward extraction, redistribution, or reinvestment. The difference between these orientations is reflected through differences in between-group and within-group inequality. National-level inequality is the result of combined between-group and within-group inequality. Under an extractive regime, within-group inequality is typically low to moderate, while between-group inequality is high. Under a redistributive regime, both within-group and between-group inequality is low to moderate. Finally, under a regime that is oriented toward reinvestment, between-group inequality is typically high, and within-group inequality can be either moderate or high.

Change in inequality can be driven by either internal or external change agents, where internal agents generally promote reform of the system, while agents external to the government – whether citizens or non-citizens – seek to take control of the state. Internal agents usually produce gradual change in within-group inequality, although a conversion to a reinvestment regime may trigger a gradual rise in between-group inequality. In contrast, external agents usually produce rapid change in between-group inequality.

The available data do not permit a detailed exploration of Chakravorty's theory. International income distribution data provide urban and rural income distributions for some countries, but do not provide income distributions for other important groups, such as those identified by gender, religion, or ethnicity. Also, the spatial distribution of inequality is, for most countries, impossible to study with the currently available data. Instead, the broad link between state ideology and aggregate national income is explored in this paper and used as a basis for the quantitative scenario model presented in the last section.

Quantifying State Ideology: Selectorate Theory

One aspect of the “Fragments of Inequality” model that makes it difficult to test and implement in a quantitative scenario model is that there is no guidance in how to represent changes in regime. The Selectorate theory of Bueno de Mesquita, Smith, Siverson, and Morrow (Bueno de Mesquita et al. 2003; Morrow et al. 2008) fills this gap. In this theory, the extent to which a regime is extractive (that is, prefers to distribute private goods to its supporters rather than public goods) depends on the size of the “winning coalition” in political contests relative to the size of both the polity as a whole and the “selectorate” – that is, the number of people who nominally have a say in the choice of leader. For example, in a well-functioning democracy with universal suffrage and two parties, the selectorate is essentially the adult population and the winning coalition might be close to, but slightly greater than, half the selectorate. In contrast, in a rigged electoral system, the selectorate may nominally be the adult population, but the winning coalition is very small as a proportion of both the polity and of the selectorate. According to Selectorate theory, the second regime would have greater incentive to provide private goods to its supporters at the expense of the larger population, while the first regime would have greater incentive to provide public goods.

VARIABLES

The main data set used for the study is a modified version of the data set described in (Bueno de Mesquita et al. 2003) and made available by them online as “The Logic of Political Survival Data Source” (Bueno de Mesquita et al. 2002), referred to in what follows as the LPS data set. The LPS data set includes publicly-available sources, sources that the LPS authors gained permission to publish, and

their own synthetic variables. One of the LPS synthetic variables that is used in this study is a measure of the size of the winning coalition relative to the size of the polity (W). This variable is composed of a variable coding for regime type; variables coding for the competitiveness and openness of recruitment of the executive; and a variable coding for the competitiveness and stability of political parties. Because the component variables are discrete, W also takes discrete values at 0.00, 0.25, 0.50, 0.75, and 1.00. For the study described in this paper, the LPS variable W was renamed to *winning.cln* as a convenient mnemonic.

Income inequality is measured using the Gini coefficient. Rather than use the Gini coefficients from the LPS data set, Gini coefficients from the more recent World Income Inequality Database ver. 2.0 b, referred to here as the WIID2b data set (UNU-WIIDER 2007) were used. Despite the relatively high quality of the income distribution data in the WIID2b data set, income inequality data must be treated with caution (Chakravorty 2006; UNU-WIIDER 2007). Inconsistencies in data definition or collection procedures can be seen reflected in the different values for estimated Gini coefficients calculated using different surveys for the same country and the same year found in the WIID2b database. Furthermore, Gini coefficients may be calculated for the distribution of expenditure or income, may or may not reflect taxes and transfers, and may or may not cover the entire population. The focus of this paper is on income distribution net of taxes and transfers, so, to mitigate the impact of problematic inequality data and to extract the most relevant measure of inequality for the present analysis, the following procedure was followed for selecting Gini coefficients from the WIID2b database:

1. Any surveys that did not cover all age groups or all of the country (e.g., urban only, rural only) were excluded,
2. Preference was given to high-quality surveys as reflected in the quality score in the WIID2b database,
3. Preference was given to surveys that were from the same source (for example, the Bangladesh Household Expenditure Survey, which measures both income and expenditure)
4. Preference was given, in decreasing order of importance, to surveys that a) reported income rather than expenditure; b) that did not use a gross income measure (i.e., those for which it was explicitly stated that gross income was reported); c) that covered the entire population (in contrast to wage earners only), and; d) that reported for individuals as opposed to households

Additionally, two dummy variables, *gini.is.expend* and *gini.is.gross* were added for those country-year combinations in which income data were not available or for which gross income (income before taxes and transfers) was indicated as being reported. Typically, Gini coefficients for gross income are higher than for net income, since taxes and transfers tend to reduce disparities, while Gini coefficients for expenditure are less than those for income. This suggests that, in a regression for which the Gini coefficient is the dependent variable, the coefficient of *gini.is.expend* should be negative, while the coefficient of *gini.is.gross* should be positive.

The selectorate-theoretic variable *winning.cln* should, according to Selectorate theory, be an indicator of the degree to which a regime is extractive, with lower levels (smaller winning coalition size compared to the size of the polity) being associated with higher levels of extraction. According to Chakravorty's theory, a low *winning.cln* should therefore lead to higher levels of inequality than under a redistributive regime, and may or may not be higher than under a reinvestment regime. To distinguish between regimes with a high value for *winning.cln* a measure distinguishing redistributive from reinvestment regimes is needed. As a measure of redistribution vs. reinvestment, a composite variable, *redist.bias*, is constructed from the LPS data set, defined as:

$$redist.bias = \frac{R-I}{S}, \quad (1)$$

where R is redistributive spending, defined as spending on social security and welfare,

$$R = GXPDSSEC, \quad (2)$$

I is government spending on social investment, defined as spending on education and health,

$$I = GXPDEDUC + GXPDHLTH, \quad (3)$$

and S is total social spending, the sum of R and I ,

$$S = R + I. \quad (4)$$

The variable *redist.bias* is a measure of the extent to which public social spending (the denominator) is dominated by immediate transfers (spending on social security and welfare) versus expenditures with a delayed return to the recipient (education and health). This is taken to be a measure of the regime's bias toward short-term redistribution versus reinvestment of funds.

It can be expected that in addition to the direction of public social spending, as reflected in *redist.bias*, the level of spending should also be of importance. However, the level of spending should already be captured by the *winning.cln* variable since, according to Selectorate theory, a higher value for *winning.cln* should be associated with a higher level of public spending. Moreover, according to Selectorate theory, *winning.cln* should have better explanatory power than public social spending in distinguishing between extractive from non-extractive regimes, so it should not be necessary to explicitly include the level of public social spending in the model.¹ We tested this hypothesis and found it to hold with the data set collected for this paper.

GRAPHING STATE IDEOLOGY

The expected relationship between the variables used in this paper and the categories of state ideology proposed by Chakravorty are shown schematically in Figure 1. As shown in the figure, as the size of the winning coalition increases, the regime shifts from an extractive orientation to either reinvestment or redistribution, with the difference being determined by the redistributive bias. At low levels of *winning.cln*, the *redist.bias* variable should have no influence, since in that case, the regime is extractive and there is little social spending. To reflect this, the product $winning.cln \times redist.bias$ is used to distinguish reinvestment-oriented vs. redistributive regimes. [Later, in the regression, we use $(0.25 + winning.cln) \times redist.bias$, where 0.25 is added to *winning.cln* in order not to remove all variation in *redist.bias* when *winning.cln* is equal to zero.]

It is also instructive to see where countries lie relative to the triangle shown in Figure 1. This is shown in Figure 2, which plots countries for different years against the explanatory variables. In the figure, the size of the labels is proportional to the value of the Gini coefficient for the country in the given year, and the data are jittered to minimize the overlap between labels. Values for the Gini coefficient are restricted to net income measures. Ignoring fixed factors, such as regional membership, Chakravorty's theory suggests that the Gini coefficient should increase when moving away from the upper-right vertex of the triangle. The expected trend can be seen in the data, as the size of the labels generally increases from the upper-right of the figure towards the lower and left-most regions of the figure. There

¹ More accurately, the ratio of the size of the winning coalition to the selectorate should explain the level of social spending. However, this ratio is highly correlated with the size of the winning coalition in the LPS data set. For simplicity, we use the size of the winning coalition throughout as an explanatory variable.

are important exceptions to the general trend, such as for Pakistan in 1986, Bangladesh in 1989, and Brazil in 1990.

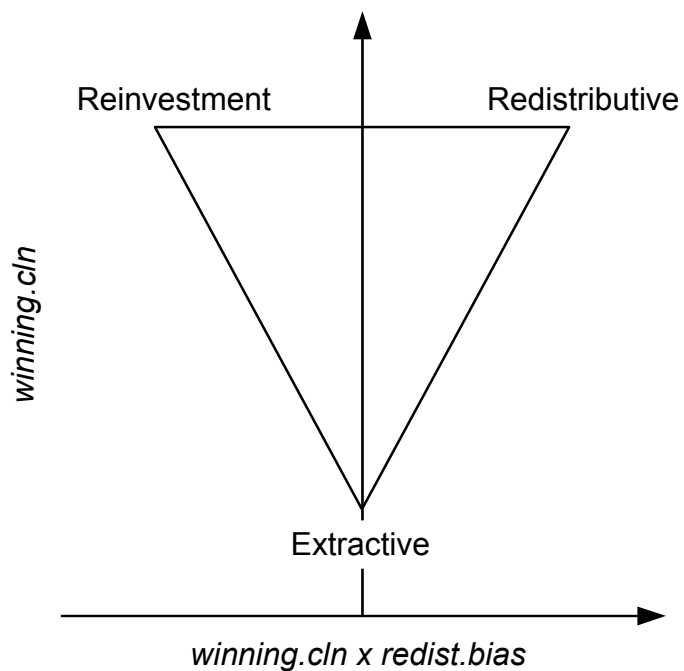


Figure 1: Relationship between regime ideology and study variables

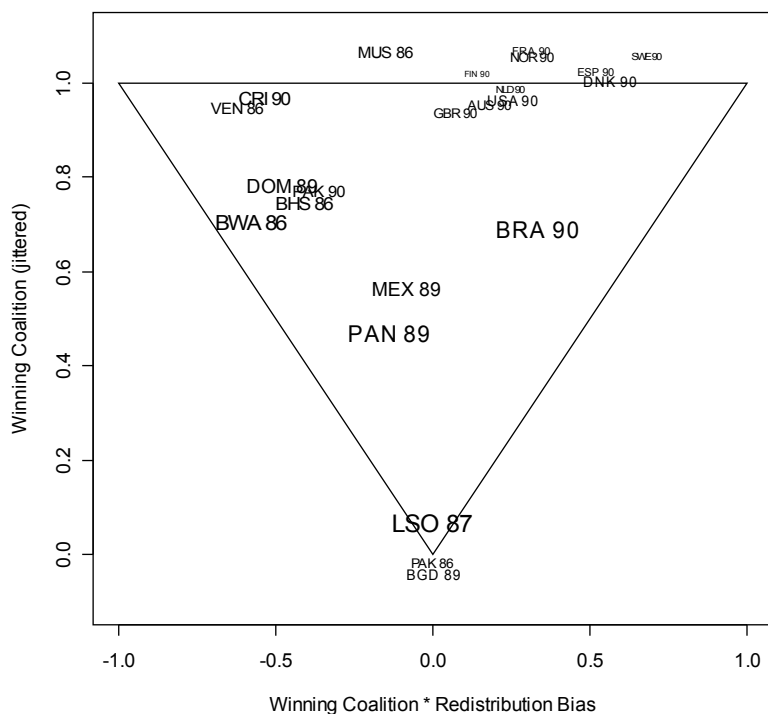


Figure 2: Countries plotted against explanatory variables (size is proportional to Gini coefficient)

Figure 2 is a static plot. To see how a single country changes over time, Figure 3 shows the trajectory of the United States between 1979 and 1990. The figure plots Gini coefficient against *redist.bias*, as over this period the value for *winning.cln* for the United States did not change. As can be seen in the figure, from 1979 through 1983, *redist.bias* did not change substantially, although the Gini coefficient rose. After 1983, *redist.bias* fell while the Gini coefficient rose, consistent with the predictions of Chakravorty's theory.

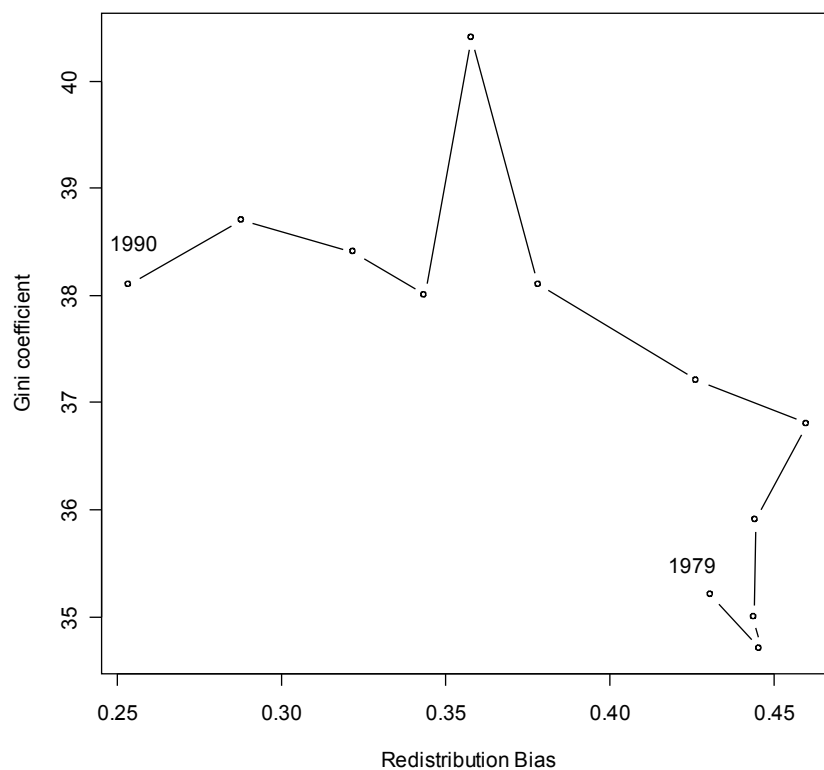


Figure 3: Trajectory of the United States, 1979-1990

Model Estimation

The data form a sparsely populated panel. The data set is limited to the two decades 1970-1990. Moreover, it is potentially biased toward countries that collect more consistent and complete data on income inequality and social spending, principally but not uniquely high-income democracies. However, it has coverage amongst both high-income and low-income countries, with both high and low levels of income inequality and is collected from the best available international data set at present. In keeping with the perspective of Ahluwalia (1976), the importance of the subject encourages us to press forward with the analysis despite the limitations of the data.

In addition to the key socio-political variables *winning.cln* and *redist.bias*, Chakravorty's theory suggests that fixed factors, such as region (through regional history) and the degree of social inhomogeneity, influence distributional outcomes. To test these propositions, two other variables from the Bueno de Mesquita et al. data set are included in the analysis: *region* (global regions recoded as

factors defined as: LAC for Latin America and Caribbean; ME for the Middle East; EE for Eastern Europe; AFR for Africa; SA for Southern Asia; EA for Eastern Asia; and OECD), and *elf* (the ethnolinguistic fractionalization index, determined in 1960 and considered as a fixed factor for the country for this analysis). Regional coefficients are expected to follow generally observed patterns, for example, that Gini coefficients are systematically higher in LAC and AFR than they are in OECD and SA; a higher degree of ethnolinguistic fractionalization is expected to be associated with higher inequality.

While Chakravorty's theory makes no explicit assumptions about mean national income, the historical importance of GDP per capita in studies of income inequality urges its inclusion. For this reason, GDP per capita adjusted for purchasing power parity from the Penn World Table (variable *rgdpch* in LPS) is included in the analysis as *pwt.gdppcch*. To allow for an inverted-U shaped dependence on GDP per capita, the variables $\log(pwt.gdppcch)$ and $\log^2(pwt.gdppcch)$ were included in the model. For a Kuznets-like relationship, the coefficient of the log of GDP per capita should be positive, and the coefficient of the square of the log of GDP per capita should be negative.

Table 1: Statistics for pooled regression

	Value	t-value
(Intercept)	67.54	1.18
ME	-11.63	-4.01 ***
AFR	-1.45	-0.43
SA	-19.71	-5.72 ***
EA	-8.22	-4.62 ***
OECD	-12.69	-6.86 ***
<i>elf</i>	6.63	3.30 **
<i>winning.cln</i>	-9.73	-3.37 ***
<i>gini.is.expend</i>	-0.66	-0.48
<i>gini.is.gross</i>	3.22	3.26 **
$\log(pwt.gdppcch)$	-3.15	-0.23
$\log^2(pwt.gdppcch)$	0.16	0.19
$(0.25 + \textit{winning.cln}) \times \textit{redist.bias}$	-2.67	-1.87 •
R^2	0.66	
$F(12,268)$	43.11	

Statistics for the pooled regression are shown in Table 1. As seen in the table, *winning.cln* is strongly significant and also substantively important: a change from zero to one is associated with a decline of nearly ten percentage points for the Gini coefficient. The aggregate variable $(0.25 + \textit{winning.cln}) \times \textit{redist.bias}$ is marginally significant (*t*-value -1.87). Ethnolinguistic fractionalization increases inequality, and is both statistically and substantively significant. Income variables are not significant, with *t*-statistics close to zero. The use of expenditure-based Gini coefficients does not significantly affect the outcome, while gross income Gini coefficients are systematically higher than Gini coefficients measured from income net of taxes and transfers. Regional coefficients are, for the most part, significant. They are all negative, a consequence of the fact that the reference region is LAC.

Since LAC has higher levels of inequality than any other region (although inequality in Africa is similar), the coefficients on all other regional dummies are negative.

All coefficients except for those of log income and the square of log income are of the expected sign: as the winning coalition increases in size, the Gini coefficient declines, and similarly for the other main variable, $(0.25 + \textit{winning.cln}) \times \textit{redist.bias}$; the coefficient of the expenditure dummy is negative, while that of the gross income dummy is positive.

Constructing Scenarios

In this section we propose a scenario model for income inequality and then apply it to some stylized global scenarios. The proposed scenario model for country i is:

$$G_i(t) = G_{\text{ref}} - 2.67(0.25 + W_i(t))R_i(t) - 9.73W_i(t) + \Delta G_i(t), \quad (5)$$

where $G_i(t)$ is the Gini coefficient over time, $R_i(t)$ is the *redist.bias* over time, $W_i(t)$ is the size of the winning coalition, *winning.cln*, over time, and $\Delta G_i(t)$ is the residual (or shift factor) over time. The constant G_{ref} is the Gini coefficient for a reference region: for example, for the OECD it would be, from Table 1, $67.54 - 12.69 = 54.85$.

At time $t = 0$, $R_i(0)$ and $W_i(0)$ take their base-year values, while $\Delta G_i(0)$ is the difference between the observed Gini coefficient in the base year and the value calculated using the model. All of the (relatively) fixed factors, such as world region and ethnolinguistic fractionalization are captured in the residual $\Delta G_i(0)$.

In order to calculate $G_i(t)$, trajectories for the other variables must be specified. The variable $R_i(t)$ takes values from -1 to 1, while $W_i(t)$ takes values from 0 to 1. The Gini coefficient $G_i(t)$ takes values from 0 (perfect equality) to 100 (in which one person takes all of the income). In the scenarios described below, it is assumed that all countries become more similar to one another—that is, these are scenarios of global convergence. While this is certainly not a necessary assumption for using this model, it permits a convenient application of the model to a large data set.

To simplify the scenario formulation, trajectories are specified in terms of time scales of different processes. In order of increasing length of time, these are:

1. τ_R , the time scale for relatively rapid policy changes regarding orientation toward redistribution or reinvestment (typically, years or decades),
2. τ_W , the time scale for long-term changes in political institutions that influence the size of the winning coalition (typically, half-century to century time scales),
3. τ_G , the time scale over which the influence of the historical context of a country over its income distribution gets diluted (perhaps multiple centuries).

The second step is to specify long-term convergence targets for R and W . The targets R_{targ} and W_{targ} can capture particular scenario story lines. For example, a scenario of long-term convergence on a reinvestment world (see Figure 1) would correspond to long-term values of $R_{\text{targ}} = -1$ and $W_{\text{targ}} = 1$, while a long-term trend toward extractive regimes might correspond to long-term targets of $R_{\text{targ}} = -1$ and $W_{\text{targ}} = 0$. With the time scales and targets, the trajectories become

$$R_i(t) = R_i(0) + (1 - e^{-t/\tau_R})(R_{\text{targ}} - R_i(0)), \quad (6a)$$

$$W_i(t) = W_i(0) + (1 - e^{-t/\tau_w})(W_{\text{targ}} - W_i(0)), \quad (6b)$$

$$\Delta G_i(t) = e^{-t/\tau_g} \Delta G_i(0), \quad (6c)$$

where Equation (6c) uses the approach described in Kemp-Benedict (2008) to propagate the base-year residual in the scenario.

EXAMPLES

The scenario model presented in Equations (5) and (6a-c) was applied to 104 countries using a set of Gini coefficients based on the WIID2b data set and values for W (from 1999) and R (for various years pre-1990 and post-1999). The coverage of R was extended using data from the World Bank's *World Development Indicators*, which has coverage of the relevant variables from 2000-2004 (World Bank 2008). For the base-year data, the most recent value for R was chosen. The reference region is the OECD, so G_{ref} is 54.85.

For the scenarios, the following time scales were assigned:

1. $\tau_R = 25$ years ,
2. $\tau_W = 75$ years ,
3. $\tau_G = 200$ years .

Scenarios were run over a 50-year time period. The scenarios differed in the target values R_{targ} and W_{targ} . The different scenarios correspond to the three “pure” regime types identified by Chakravorty (2006) and illustrated in Figure 1:

- *Reinvestment*: $R = -1, W = 1$
- *Redistributive*: $R = 1, W = 1$
- *Extractive*: $R = -1, W = 0$

The results are shown in Figures 4-6. Two features should be noted. First, because the scenarios assume convergence between countries, the current distribution of Gini coefficients (shown in gray in the figures) becomes more narrow over time in each scenario. Second, the broad features of Chakravorty's model can be seen in the graphs. The lowest levels of inequality are seen in the *Redistributive* scenario (Figure 5), while the highest are seen in the *Extractive* scenario (Figure 6). The world anticipated by Fukuyama in *The End of History and the Last Man* (1992), in which all countries converge on liberal democratic governments that embrace free-market goals, corresponds to the *Reinvestment* scenario (Figure 4), which has levels of inequality between the two extremes.

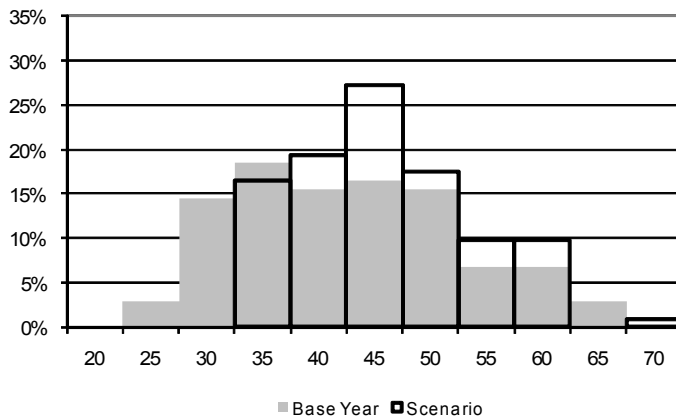


Figure 4: Current and future inequality, *Reinvestment* scenario

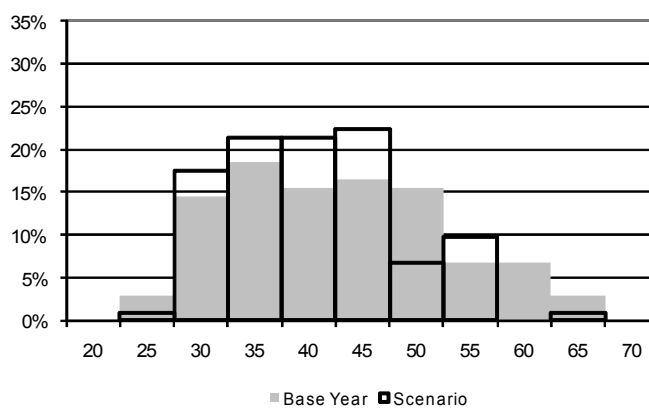


Figure 5: Current and future inequality, *Redistributive* scenario

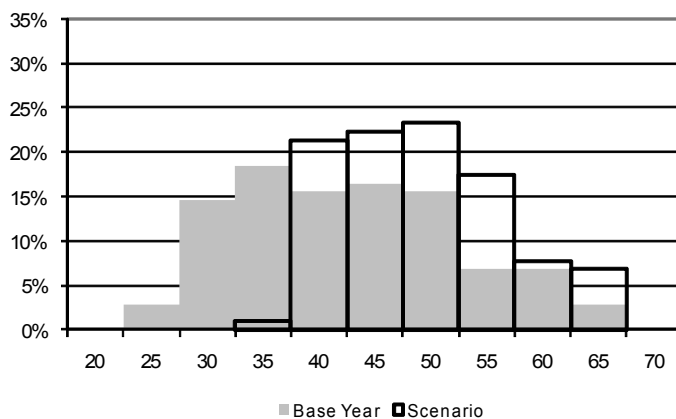


Figure 6: Current and future inequality, *Extractive* scenario

Conclusion

To date, the theoretical basis for constructing scenarios of within-country income distributions has remained weak. However, recent research into the determinants of income inequality have suggested the importance of social and political factors compared to purely economic factors, and the theory of Chakravorty (2006) draws broadly on economic, sociological, and geographic literature to provide a compelling theory of income distribution that emphasizes state ideology as an important explanatory factor. Moreover, the Selectorate theory of Bueno de Mesquita et al. (2003) provides a way to quantify those factors of state ideology that are relevant for Chakravorty's theory. The combination of the two theories provides a quantitative model of income distribution that can be applied in long-term sustainability scenarios. As described in this paper, the model performs well under empirical test, and can be used to generate long-term scenarios of within-country income distribution.

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