Counting Calories: Democracy and Distribution in the Developing World

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Abstract

How does regime type affect the poor? And are certain types of regimes better at translating economic growth into consumption for the world's least privileged citizens? We propose an alternative measure of transfers to the poor that is nearly universally available and innately captures distribution: average daily calorie consumption. In sharp contrast to the consumption of material goods or the accumulation of money for which humans have shown no upper bound on their ability to achieve, biological limits make it impossible for a small number of individuals to consume most of a nation's calories. We find that for a variety of model specifications, democracies are better at translating economic growth into calorie consumption and discuss two potential causal mechanisms linking regime type to pro-poor growth.

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Does democratic governance reduce inequality? Does it deliver material benefits to the poor? Recent years have witnessed a surge in interest in the relationship between democracy, income inequality, and the well-being of the materially least well off. Research in this area has delivered a swath of findings associating democracy with lower inequality, better health care, more spending on education, and even rural electrification. Yet the most notable feature of this research might be its failure to reach consistent results or identify key mechanisms.

Since the influential theoretical results of Meltzer and Richard (1981) demonstrated that inequality should raise redistribution in democracies, much empirical research has focused on the paradox of redistribution: explaining why the predicted redistribution meets with contradictory results in the data. Research asserts that democracy diminishes (Reuveny and Li 2003), first increases then diminishes (Chong 2004, Chang 2007), and has little effect (Timmons 2008) on income inequality; that redistribution increases (Milanovic 2000; Kennworthy and Pontusson 2005) and decreases (Korpi and Palme 1998; Bradley et al 2003; Moene and Wallerstein 2001) with inequality in democracies; and that economic policies that influence inequality favor (Acemoglu and Robinson 2003) and do not favor (Mulligan et al 2004) the poor in democracies. Some have claimed evidence of redistribution under democracy conditional on turnout (e.g., Lindert 2004, 2006, Kenworthy and Pontusson 2005) while others identify political stability (Muller 1988) or other conditioning factors. Given the volume and, indeed, frequent sophistication of this work, it is surprising that such varied results emerge. The true paradox of redistribution may not be the the weak empirical support for the Meltzer Richard (1981) result but the broad array of often conflicting empirical results that emerge from a small number of datasets.

We argue that empirical scholarship on inequality is afflicted by both a theoretical and a data problem. Theoretically, we assert that redistribution must be conditioned on growth. Economic expansion ameliorates politically costly zero-sum redistribution by allowing government to divert new revenue to the neediest. Not only is tax-based redistribution greater with higher tax revenue captured during expansions but the political cost of raising taxes is lower. Wealthy and middle-class voters oppose parties associated with greater taxation when they expect (Durr 1993) or experience (Stevenson, 2001, Kayser 2008) a weak economy. Conditioning on economic performance is even more imperative in developing countries in which growth can be volatile. Scholars employing cross-sectional time-series data from the developing world can reach markedly different conclusions on the relationship between inequality and redistribution depending on growth rates in the time period of their sample. Thus we argue that democracies redistribute more readily when they can distribute surpluses from growth rather than raise taxes.

Empirically, we argue that data limitations in poor countries compel scholars to choose between broad measures of inequality in unrepresentative and small samples of countries and narrow, incomplete measures of welfare in a broader sample. Narrow measures of welfare such as infant mortality or certain social services are more widely available but offer a questionable proxy for general material welfare.[1] Broader measures such as Gini indices of income inequality succeed at capturing broad income distribution but are simply absent for most developing countries.[2] Moreover, those Gini measures that do exist are often not comparable across nations or even within the same nation over time (Atkinson and Brandolini 2001; Person and Tabellini 2000, p. 122).[3] Finally, broad measures of inequality do not necessarily capture changes in the welfare of the least well off. A given shift in a Gini coefficient could result from improvements in the welfare of the poor or from income gains by the middle class. Indeed many empirical results that are able to show redistribution have more difficulty demonstrating that the poorest segments benefited (e.g. Lindert 1994, 1996). Once representative data are employed, what effect does democracy have on the allocation of gains from growth?

We propose an alternative measure of transfers to the poor that is nearly universally available and innately captures distribution: average daily calorie consumption. In sharp contrast to the consumption of material goods or the accumulation of money for which humans have shown no upper bound on their ability to achieve, biological limits make it impossible for a small number of individuals to consume most of a nations calories. In poor countries that have not yet escaped the Malthusian trap, mean calorie intake captures distribution to the poor regardless of whether it comes from direct transfers, tax benefits, employment schemes, or a host of other means. Moreover, calorie data are available since 1961, thanks to the efforts of the Food and Agriculture

[1] In fact, they may also suffer from sample bias: In a recent and likely influential paper, Ross (2006) has meticulously documented the non-random pattern of missingness in commonly used data that leads to the listwise omission of many high-performing authoritarian states. After imputing missing observations and adding country fixed effects, he reveals that there no longer exists a robust statistical relationship between democracy and lower infant mortality rates. Other scholars have questioned the wisdom of using infant mortality at all for international comparison since infant mortality statistics are prone to inconsistent measurement across countries (Hogberg 2006, Howell and Blondel 1994, Spencer 2004). One reason for this is that these statistics assume interaction with a health care system and many babies in the developing world are born outside of a hospital. In addition, many underdeveloped countries do not have functional vital registration systems. As a result underreporting of infant births and deaths a major source of potential bias (Adetunji 1995).

[2] Houle (2008) calculates that the commonly used Deininger and Squire (1996) Gini dataset provides observations for only 11 percent of all possible country-years, well below any reasonable cut-off for imputation. The pattern of missingness is also non-random.

[3] Atkinson and Brandolini (2001), in fact, go farther when examining commonly used datasets on income inequality and note that they "are not convinced that at present it is possible to use secondary data-sets safely without some knowledge of the underlying sources, and [they] caution strongly against mechanical use of such data-sets."

Organization (FAO) of the United Nations, in an internationally standard format for nearly all countries of the world.

How institutions affect redistribution to the poor is normatively important in itself. But the assumption that democratization entails redistribution is also key to the most influential theories of democratization. The two most prominent theories to emerge recently argue that elites accede to democratization when either the attendant redistribution is not too costly (Boix 2003) or when the cost of redistribution is exceeded by the cost of repression (Acemoglu and Robinson 2006). Empirical tests of both theories have found little support for these claims (Houle 2008) which begs the question of why inequality does not have the predicted effects on democratization. One possible explanation is that a critical assumption of this literature — that democracies redistribute more than autocracies — is far from established. Even the predictions of Meltzer-Richard (1981) that redistribution should increase in tandem with inequality *within democracies* has found decidedly mixed empirical support (Kenworthy and Pontusson 2005). This raises the question of whether the burgeoning democratization literature is erected on unstable theoretical foundations. Should democracies fail to redistribute more than autocracies, it is simply not evident why income distribution should matter for democratization.

Reassuringly, some indirect evidence does suggest that democracy does play a role in redistribution. Although not as developed as the literature on distributional consequences of different institutions within democracies (e.g., Persson and Tabellini 2003, Milesi-Ferretti et al. 2002, Bawn and Rosenbluth 2006), scholars have successfully identified differences in the provision of broad, hence redistributional, goods between democracies and autocracies. Stasavage (2005), for example, investigates whether the move to multiparty electoral competition undertaken by African countries in the 1990s led these governments to spend more on primary education. He finds that when countries are subject to multiparty competition, African governments have spent more on education and more on primary education, in particular, without altering the amount spent on universities. Using a newly created dataset of night lights visible from satellites, Min (2008) argues that democratization is associated with a substantial increase in electrification. In contrast, however, Mulligan et al. (2004) find no significant difference between autocracies and democracies in terms of social and economic policies.

Assuming that institutional quality, rule of law, and property rights are generally stronger in democracies allows for more insight. Azfar (2005) finds that higher levels of institutional quality lead to faster growth for society's poorest quintile. Sadler and Akhmadi (2004) find that regions of Indonesia with better institutions experienced faster rates of poverty reduction. An empirical study of property rights and poverty found that well-established property rights help the economic prospects of all citizens, not merely those who have the most property in need of protection as was previously believed (Knack 2003). This suggests that better property rights are at least neutral to the poor while others claim substantial benefit for the poor (DeSoto 2000). In contrast, Dollar and Kraay (2002) find that rule of law has no systematic effect on pro-poor growth. In what is the probably the most comprehensive of these studies, Kraay (2006) finds little evidence that institutional factors, like regime type or institutional quality, are correlated with changes in measures of inequality.

In the remainder of this paper we argue that many of the conflicting findings on inequality stem from poor data and offer an alternative measure of inequality that is universally available in nearly all countries after 1961 and, unlike Gini coefficients, offers the additional advantage of gauging the material well-being of the poor. Using data on average daily calorie intake, we ask two questions: (1) what role does democracy play in the relationship between growth and inequality? And (2), since measures of income inequality do not necessarily capture the well-being of the worst off, how do democratic institutions govern the effect of growth on the poorest members of society?[4] We find that a larger share of economic expansion reaches the less-privileged in poor democratic regimes than in their autocratic counterparts. In a variety of model specifications, democracies prove better able to turn economic growth into both total calorie consumption and high quality calories from animal products. Since no elite is capable of increases in calorie consumption sufficient to yield a non-trivial rise in the national per capita mean, we have strong evidence that democracies favor broader distribution.

1 How Democracy Conditions Growth Dividends

While there do not currently exist well-established theories linking elections and democracy to pro-poor growth, there are at least two hypotheses that find at least some support in the existing theoretical literature. The first is that democracies — as a result of the electoral connection — invest broadly in the human capital resources of their citizenries to a greater extent than autocracies and that human capital development better positions the poor to take advantages of opportunities presented by economic growth. The second is that candidates, parties, and incumbent governments in democracies (and perhaps even electoral autocracies) distribute targeted patronage to woo voters — the majority of whom are poor (since the votes of the poor are cheaper to "buy" than the votes of the rich) — and that economic growth increases

[4] For example, even if growth increases inequality, the poor may enjoy higher levels of absolute welfare.

the resource base available for this type of redistribution. No matter how governments spend revenue to assist the poor, however, it is easier under an expanding economy. We discuss each of these hypotheses in turn.

Scholars have suggested that democracies are forced to produce more public goods as a result of accountability introduced through the electoral process (Lake and Baum 2001) and that democracies particularly attempt to provide services that improve human capital in a broad manner (Lake and Baum 2001, Baum and Lake 2003, Stasavage 2005). For example, Besley and Kudamatsu (2006) find a robust link between life expectancy at birth and democracy after controlling for income; they argue that health policy interventions are superior in democracies than in non-democracies. If democracies are better than autocracies at investing in human capital, under what circumstances will this investment create pro-poor growth? Development economists have suggested that investment in human capital is critical for the creation of growth that benefits the poor. Aghion et al. (1999) argue that there are decreasing returns with respect to individual human capital investment and describe what happens to inequality when credit constraints make it hard for people to invest in themselves. When *government* invests in human capital, however, this offers the poor an opportunity to take advantage of growth, particularly growth in non-farm sectors. In a study of pro-poor growth in Bangladesh, Sen et al. (2004) argue that an unequal distribution of the benefits of growth can largely be accounted for by unequal access to assets, especially human capital and education. In a cross-regional study of India, Ravallion and Datt (2002) find that pro-poor growth occurred in areas where initial conditions offered the poor the best opportunity to take advantage of growth. This suggests that under certain circumstances the poor can be locked out of growth opportunities but that government policies which combine human resource development with economic growth can create real benefits for the poor. This is also consistent with researchers who have argued that the positive influence of democracy may not be direct (Baum and Lake 2003) and that one potentially important indirect influence of democracy may be that democracies help to position the poor to take advantage of growth opportunities by investing broadly in human capital development.

An alternative link between democracy and pro-poor growth assumes that the electoral connection works in a slightly different way. Rather than democracy creating growth opportunities for the poor as a result of a broad investment in human capital, instead economic benefits may be directed at the poor as elections force candidates to compete for the support of voters, where candidates get the largest return for their campaign dollar from the poorest classes of society.

This is consistent with a series of previous empirical and theoretical studies which have argued that poor voters are more susceptible to clientelistic practices than wealthy voters since the marginal benefit of the consumption good is greater for them than for the rich. Dixit and Londregan (1996) argue that 'swing' voters, or those with fewer ideological constraints, represent the cheapest votes to purchase in the context of developed countries; in the developing world, these voters very often come from the lower political classes. Calvo and Murillo (2004) argue that patronage targeting the poor is more effective than patronage targeting the middle or upper classes. Stokes (2005) finds that political machines target the poor, for whom the payoff of even a small reward outweighs the expressive value of voting for one's preferred party. Blaydes (2006) finds that clientelistic voting in Egypt leads illiterates to turnout to vote at twice the rates of literates. This would suggest that clientelistically-based voting, or the electoral mobilization of lower-class individuals by more established elites, may be broadly redistributive.[5] Economic growth provides a larger resource pool from which to distribute benefits; government budgets may be bigger as well, assisting incumbent candidates. Rather than democracy interacting with growth as a result of democratic government's tendency toward broad-based human capital development, it is also possible, therefore, that growth simply increases the pool of available resources from which patron-politicians can offer clientelistic payment to poor voters and that economic redistribution to the poor occurs in this way. An important area for future research will be to operationalize these and other competing theories and determine if there exists a strong empirical basis for one over the other. First, however, we consider the empirical link between democracy and pro-poor growth where an increase in calorie availability serves as a proxy for growth that benefits the poor.

2 Calories as a Measure of Inequality

Before we turn to the relationship between democracy and calories, we first consider the calorie data itself and how calories relate to Gini scores, the most common measure of income inequality. While daily average calorie intake is not without its own idiosyncracies, it is available for nearly all countries since 1961 when the FAO began collecting it in a fairly standardized and, hence,

[5]Clientelism is generally defined as a relationship between parties of unequal status that involves some form of exchange. Clientelist benefits may include dividends from vote buying, though these types of relationships can develop over the long or the short term and may not involve cash money but rather goods or services rendered on the part of the patron in exchange for the client's vote. Clientelistic practices can be distinguished from constituency service by the extent to which reciprocity is enforced and are further distinguished from broad-based investments in human capital development as described above.

internationally comparable manner. Two reasons underpin our conviction that mean national daily calorie intake proxies for income distribution. First, the poor have the most capacity and demand to increase their food consumption. Food security is the single most immediate concern of the very poor. The poor spend a disproportionate share of their income on food — over 60 percent of the poorest Moroccans' income, for example (World Bank 2001) — and they are most likely to spend marginal increases in income on food.[6] This is reflected in the positive and concave relationship between calorie consumption and per capita income found in research (See, for example based on ASEAN countries, Soekirman et al. 1992, Fig 4.02). It also motivates us to study how *changes* in income translate into calories. The wealthy do not spend increases in income on food, while the poor do. Second, food is difficult to hoard. While most commodities — real estate or money, for example — can be held by a small percentage of the population, there is, beyond a certain level, no reason to accumulate food, which tends to be perishable and offers poor returns. Combined with the fact that there is a biological limit on the amount a single human can consume, we have grounds to infer that non-trivial shifts in mean daily calorie intake on the national level are widely distributed.

Allowing that calories should theoretically capture inequality is quite different from establishing their empirical validity, however. Here we directly address the question of how well and under what circumstances calorie intake can serve as a proxy for income inequality. Implicit in this concern is the question of how calories are distributed. We have argued that calories proxy for the distribution of income to the less well-off because of biological limits on calorie consumption. In other words, wealthy individuals are unlikely to spend increases in income on food whereas the poor are likely to increase calorie consumption with increasing income. But do increases in mean calorie intake actually benefit the poor or might changing patterns of consumption among the middle class drive our results?

To confront these questions, we examine the relationship between mean calorie intake and three measures from the Deininger and Squire (1996) inequality dataset: Gini coefficient estimates of income inequality and the cumulative proportion of income going to the lowest and highest quintiles of earners. We have pared down the Deininger and Squire dataset to only those observations identified by the authors as "high quality."[7] We then also removed data from single-observation studies to ensure greater comparability between observations within the same

[6]The *average* Afghan and Egyptian households spend about 45 percent of income on food (See Ban Ki-Moon, "The New Face Of Hunger," Washington Post March 12 2008 and the Egyptian Gazette October 17 2007 for more details).

[7]This removed all observations (1) based on surveys with less than national coverage, (2) from inconsistent sources, (3) missing clear references to a primary source, (4) based only on the income earning population or (5) from non-representative tax records.

	Gini	Bottom Quintile	Top Quintile
TotalCalories	-20.619	4.734	-17.444
	(1.995)	(0.483)	(1.748)
GDP/Cap	9.431	-2.301	8.726
	(1.181)	(0.287)	(1.037)
N.Obs.	130	117	117
R^2	0.471	0.480	0.494

Table 1: *Calories and Inequality. Total calorie levels prove a strong predictor of income inequality, controlling for income level. Total calories is denominated in thousand calorie units.*

country. Finally, as above, we limit our sample to countries with per capita incomes of less than $10,000 per year.

Table 1 estimates a simple linear model of the relationship between Total Calories and three measures of inequality, controlling for per capita income levels. One quickly sees that once the covariation between the (logged) income level, calories and each dependent variable is accounted for, mean calorie intake emerges as a strong and significant predictor of inequality.

The first column reveals that a 100 calorie increase is associated with a drop of approximately two points in the Gini coefficient of inequality. Of course, changes in an aggregate measure of inequality can arise from multiple shifts in income, not all of which involve the poor. The next two columns address this concern. Regressing calories and per capita income on the proportion of national income going to the bottom income quintile shows that the poor indeed do gain. A 100 calorie increase in average food consumption is significantly associated with an increase in the bottom quintile's share of national income of nearly half a point. This is a substantively large effect and argues that income gains among the poorest members of society are reflected in increases in the average national calorie consumption. As we argue above, it is the poor who are most able to increase their intake of food.

It is difficult to identify the source of income (and, hence, calorie) gains for the poor, but results presented in the third column suggests that at least some of it may be attributable to redistribution. Increases in average national calorie intake are associated with a large drop in the proportion of national income captured by the wealthiest quintile. Causality, of course, likely runs from the changes in the income share of the top 20 percent of income recipients to changes in mean calorie intake, so we reverse the interpretation: a 1.7 percent drop in the share of national income going to the top quintile corresponds to a hundred calorie increase in average calorie intake. The effects that we observe in the three models presented in Table 1 suggest that average calorie intake has a strong relationship to income distribution and, more specifically, that it is the poor who are driving this relationship.[8]

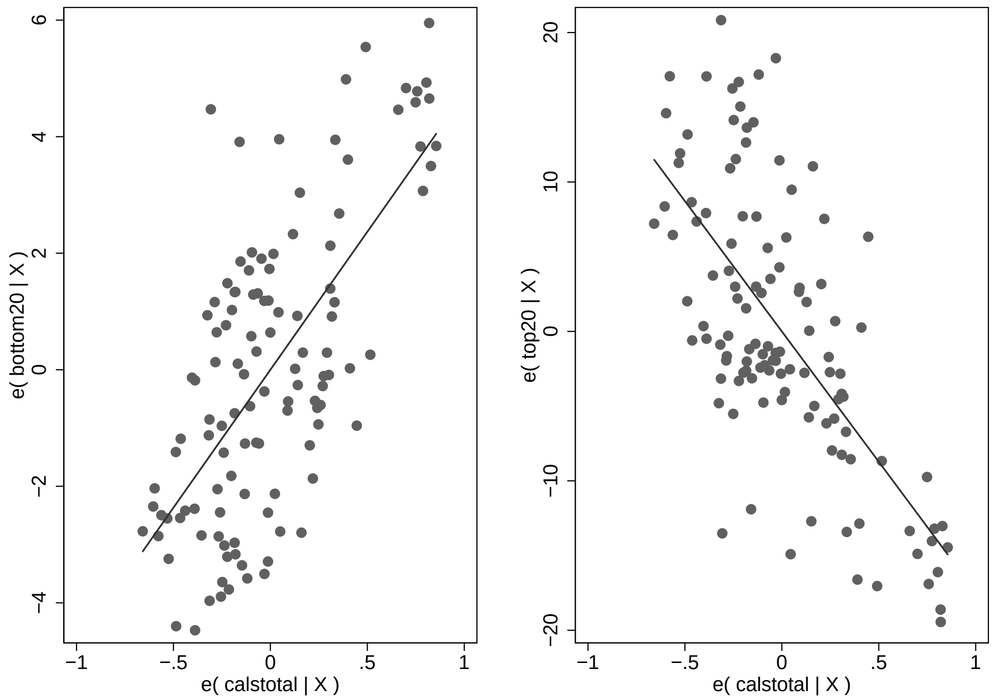

Figure 1: *Partial regression plots of total calories and the proportion of national income going to the bottom and top income quintiles after controlling for income.*

3 Democracy, Growth and Calories

3.1 Description of Data, Models, and Variables

To estimate the effect of regime type on changes in the quantity and quality of per capita calorie availability, we use a dataset that includes all country-year observations between 1961 and 2003 where GDP per capita (measured in constant 2000 US dollars) is under $10,000 per person. We have chosen a $10,000 cut-off because it is not clear if the quest for food security would remain relevant for higher levels of per capita income. Expansions in income are simply less likely to be invested in food in countries in which the preponderance of the population have already

[8] We also replicate every model on a sub-sample that excludes any state for which more than 50 percent of export value comes from oil (as identified by Alvarez et al. 2000) as well as all communist states and find the same result: increases in the proportion of national income going to the poor increase average national calorie intake while increases in the income share captured by the wealthiest quintile decrease average national calorie intake.

secured their sustenance. Thus, our dataset includes all country-years for those countries that are currently classified as low-income by the World Bank and also includes some observations from countries that would currently be classified as high income. The dataset, therefore, includes observations from countries like Italy and Israel in the 1960s but not thereafter, countries like South Korea and Greece through the mid-1990s, yet no observations for very wealthy countries like the US, UK, and Switzerland. These data are characterized by some missingness which was largely introduced as a result of using the Polity IV data (19 percent of observations are missing). Our choice of fixed effects model, as we will describe below, reduces the statistical importance of systematic cross-national differences in the patterns of missingness that may be present.

3.2 Model

The statistical analysis of time-series cross-sectional data poses a number of challenges to researchers who are forced to consider important issues related to the dynamic properties of their panel as well as unobservable country-specific factors which are referred to more generically as unit heterogeneity. We consider three panel model specifications in this paper, all estimated with ordinary least squares. In all three model specifications the dependent variable is a first difference, or in other words, the change in Y from one year to the next. This is a necessary step as mean per capita calorie consumption is non-stationary. The first model that we estimate for each dependent variable omits all fixed-effects. The second takes country heterogeneity into account with unit fixed-effects. The third adds both country and time unit effects.

The key variable of interest in our analysis is the interaction between the level of democratization in a country and that country's economic growth rate for a particular year. The base model that we use, therefore, can be characterized in the following way:

$$Y_t - Y_{t-i} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 X_2 + \epsilon \tag{1}$$

where β_3 captures the impact of a joint increase in X_1 and X_2 on Y.

3.3 Dependent Variables

There are two dependent variables: the total consumption of calories per person and the total consumption of per capita calories derived from animal products.[9] Food consumption data are

[9] In this paper, we use the terms calorie "consumption" and calorie "availability" interchangeably. While the data collected more precisely measure calorie availability, the FAO describes the data as related

taken from the FAO food balance sheets and are some of the most important data collected by the organization as these data provide the basis for UN estimation of global and national undernourishment assessments (FAO 2001).

Food balance sheets measure food consumption from a supply perspective. The total quantity of all primary and processed food commodities are added to the total quantity imported of each and adjusted to any change in stocks that may have occurred since the beginning of the reference period. The data also take into account food that is exported and attempt to quantify the type and quantity of food that is wasted, lost, or put to other use (i.e. as animal feed or seed). Because the data are obtained from a variety of sources and from over 100 countries, they are subject to inconsistencies and the FAO makes adjustments to the data and imputes missing values to maintain consistency to the overall dataset (FAO 2001). Despite a variety of attempts at quality assurance, a number of conceptual problems remain. First, the amount of food actually consumed may be lower than the quantity shown in the food balance sheet, depending on losses of edible food in preparation, as platewaste or as animal feed, and it is very hard to estimate these quantities. While it is impossible to know the exact quantity of food that is wasted, we believe that these quantities are not large in most developing countries; while the poor are unlikely to waste food, the table waste of the rich may be consumed by domestic workers or by the unfortunate class of individuals who are frequently seen sorting the trash. Second, subsistence agriculture may be underreported in the data and this might be an appreciable part of total production in some countries. In such instances, estimates may be extrapolated from household survey data multiplied by population numbers in an attempt to estimate production figures (FAO 2001).

The alternative to the use of FAO food balance sheets would be reliance on household surveys which collect information on the quantity and type of food being consumed, though there are potential sources of bias in such data as well. In addition, it would be very expensive and time consuming to collect survey data on this scale. Therefore, in the absence of a comprehensive international data set from household surveys, the food balance sheets represent the only source of standardized data that permit international comparisons over time (FAO 2001). We are cognizant of many of the potential criticisms of these data and make every effort to try and mitigate the potential biases through our statistical estimation techniques. For example, as long

to consumption. To assume that most food that is available in a country will eventually be consumed is similar to assuming that markets "clear". This may not be true for all countries, particularly, those marked by civil strife and provides an area of future research.

as inaccuracies in reporting are consistent within countries over time, they should not bias the results once country-specific effects are taken into account.

3.4 Independent Variables

There are two key independent variables in this study. The first is a measure of regime type based on the Polity IV dataset which includes a -10 to 10 scale where -10 is highly authoritarian and 10 is highly democratic. We rescale this variable by adding 10 to each observation to create a 0 to 20 scale. Setting the value of an absolute autocracy at zero will later aid interpretation of the interaction. A histogram of this variable shows a strong bimodal distribution where most countries fall into the highly democratic category (scaled value of 20) or highly autocratic (scaled value of 3).

The second key variable is the annual percentage growth rate of GDP as reported by the World Development Indicators. Rates are based on constant 2000 US dollars. This variable is normally distributed with a mean value of 3.6 percent and a fairly wide range (maximum and minimum values of 106 and -51 percent, respectively). We prune growth observations of more than 7 standard deviations from the mean, removing five observations from the total dataset.

3.5 Control Variables

The primary control variable is the log of income per capita in constant 2000 US dollars. We note that Dickey Fuller testing — and even common sense — suggest that per capita income is non-stationary but, unlike our dependent variable, we do not difference it. First, the danger of a spurious relationship from non-stationarity has already been mitigated by the first differenced dependent variables. The trend in per capita income could nevertheless induce bias in the estimation of its coefficient through a non-random pattern in the residuals but we are able to monitor this. Second, and most importantly, change in income would offer a fundamentally different control than income level. We wish to control for the effect of *wealth* on changes in calorie intake, not that of the *change in wealth* which would be be correlated with another independent variable, GDP growth. The *level* of income per capita itself may influence the change in calorie intake. As suggested earlier, wealthy countries may be associated with smaller calorie increases because more of their population have met their sustenance needs.

For each dependent variable we estimate a progression of three models: without fixed-effects, with country fixed-effects, and with country and time fixed-effects. Each has innate trade-offs. The first, and simplest, is unable to control of country-specific features omitted from the model and consequently may be susceptible to omitted variable bias should features of some countries be systematically related to variables in the model. Including country fixed-effects addresses this pitfall but at the cost of controlling for all cross-country variation and deriving all estimates from within-country dynamics. Of course, temporally specific effects — global trends or shocks in agricultural technology, for example — might also be inadvertently captured by covariates when excluded from the model, so the third model for each dependent variable also adds year dummies. In practice, adding unit and time fixed-effects sets a high bar for most models to clear but the atheoretical inclusion of so many dummies may absorb variation of legitimate and theoretically important covariates, making otherwise significant variables insignificant (i.e., Type II error). We understand that each model comes with trade-offs and consequently employ all three.

4 Results

Table 2 displays the results of the six regressions. The dependent variable in the first three columns is the first difference for total calorie consumption. The dependent variable for the next three columns is the first difference for calories from animal products. Columns 1.1 and 1.4 shows the results of an OLS regression with panel-corrected standard errors but no country or time dummies for total and animal calories, respectively. In both cases, the interaction between *Growth* and *Polity* is positive and statistically significant. Even the most autocratic of states experience an increase in both total and animal calories when the economy expands but more democratic states enjoy larger gains.

Of course, structural differences among countries other than their degree of democracy or autocracy might influence calorie consumption or even how growth conditions shifts in calorie consumption. More perniciously, omitted country characteristics might covary with *Polity* or other variables and induce bias through correlation between the error term and a covariate. Models 1.2 and 1.5 address this possibility with country fixed effects. Also, since contemporaneous cross-panel correlation or simple panel heterogeneity could bias standard errors, we again apply panel corrected standard errors. The results are impressive: the inclusion of country dummies increases the size of the coefficients on the interaction terms by 44 and 16 percent, respectively, with only minor shifts in the magnitude of their standard errors.

The effect of growth on the increase in average calorie intake at various levels of democracy is best presented graphically. Figures 1 and 2 plot the respective estimated marginal effect of growth on shifts in total (Model 1.2) and animal (Model 1.5) calories. As noted above,

	Total Calories			Animal Calories		
	NoFE	Country	CountryYr	NoFE	Country	CountryYr
	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)
GDP/Cap	1.828	-6.331	-4.837	1.322	5.556	6.742
	(1.595)	(4.347)	(5.730)	(0.489)	(1.622)	(1.706)
Growth	2.423	2.207	2.112	0.223	0.144	0.105
	(0.345)	(0.353)	(0.361)	(0.102)	(0.105)	(0.108)
Polity	-0.417	-0.140	-0.185	-0.256	-0.201	-0.129
	(0.259)	(0.340)	(0.369)	(0.095)	(0.115)	(0.110)
$Growth * Pol$	0.094	0.135	0.141	0.063	0.073	0.078
	(0.038)	(0.040)	(0.038)	(0.015)	(0.016)	(0.011)
Constant	-10.160	46.097	42.661	-7.885	-20.304	-46.748
	(10.853)	(37.145)	(38.322)	(2.937)	(13.848)	(11.407)
N.Obs.	3372	3372	3372	3372	3372	3372
R^2	0.056	0.081	0.064	0.042	0.087	0.038
Countries	113	113	113	113	113	113

Table 2: *How Institutions Condition Redistribution. The sample is defined as all countries for which we have data with a per capita income of less than 10,000 constant 2000 US dollars. The dependent variable is $\Delta CalTotal$ in models 1.1 to 1.3 and $\Delta CalsAnimal$ in models 1.4 to 1.6. All models omit five GDP growth outliers more than seven standard deviations from the mean. Panel corrected standard errors in parentheses; Pairwise calculation of covariance. Models 1.3 and 1.6, however, are estimated without the pairwise option in order to get a positive definite matrix and with unadjusted standard errors because not all panels overlap in time. Fixed-effects coefficients are omitted for presentation and space. GDP/Cap is logged.*

even the most autocratic states (where *Polity* equals zero) translate GDP growth into positive change in calorie intake. The most striking feature of the figures is the degree by which this marginal effect grows in more democratic regimes. In ambivalent democracies where autocratic and democratic features are roughly equal (i.e., a recentered *Polity* score of 10), a one percent increase in GDP growth is associated with a 3.5 percent increase in the change in mean total calorie intake. In consolidated democracies, where our polity measure equals 20, an identical increase in the rate of growth predicts a 4.8 calorie increase in the change in total calories. As the dashed 95 percent confidence interval shows, this effect is always statistically significant, regardless of the form of governance. Animal calories reveal a similar pattern but at a smaller magnitude with the marginal effect rising from approximately 0.3 in full autocracies, to 0.8 in ambivalent democracies, to 1.7 in full democracies. The poor may turn to less expensive sources of sustenance before investing any increases in income in meat. As with total calories, this effect is always statistically significant. Given that country-years in our sample experience a mean *Growth* of 3.6 percent, these effects are substantial: An average expansion of the economy corresponds to a 9 calorie difference (7.92 vs. 17.28) in the increase in average daily total calorie intake between most autocratic and most democratic states. This difference exists on a daily basis for millions of low-income individuals.

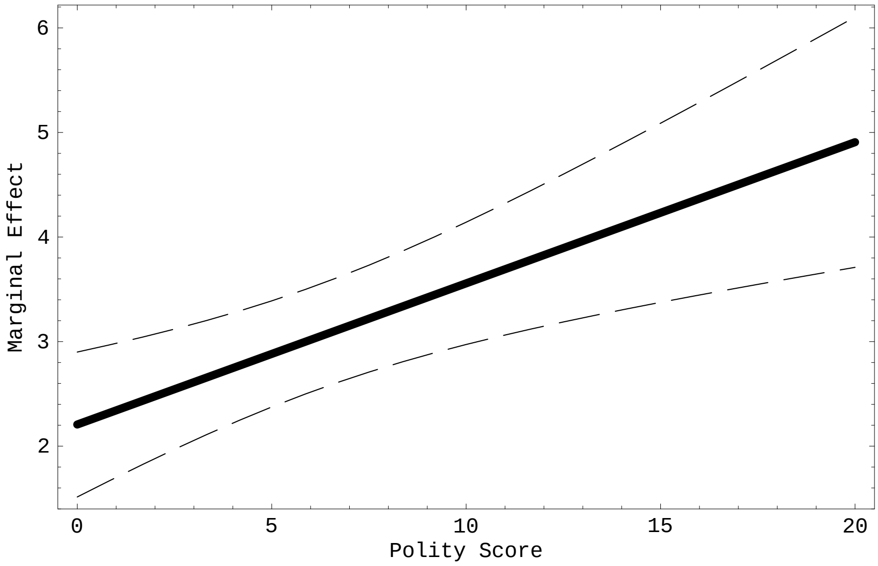

Figure 2: *Marginal effect of GDP growth on the change in total calorie intake at different level of democracy (Polity score). The plotted values are based on coefficient and variance estimates from Model 1.2 in Table 2. Dashed lines denote a 95 percent confidence interval. Polity, as in the original regression, has been recentered so that it ranges from 0 to 20.*

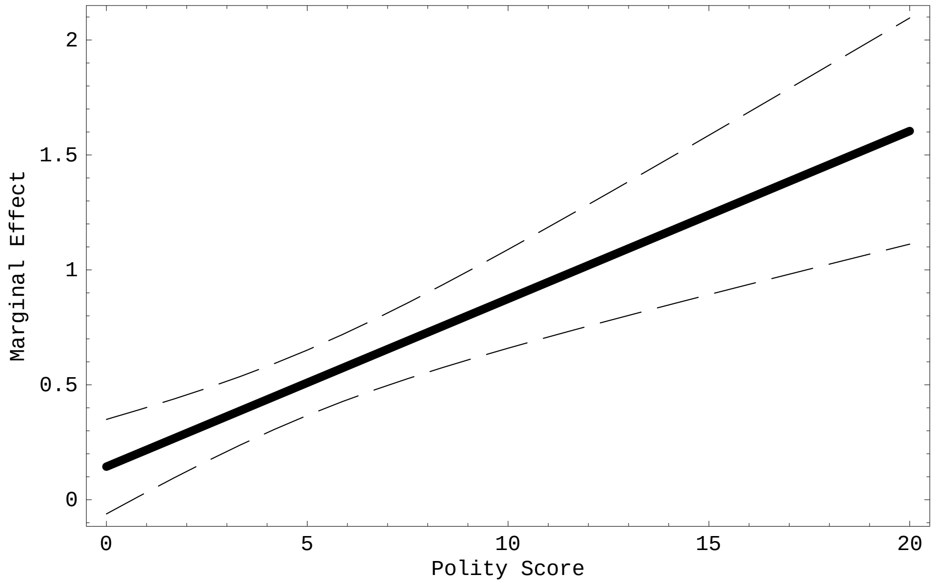

Figure 3: *Marginal effect of GDP growth on the change in animal calorie intake at different level of democracy (Polity score). The plotted values are based on coefficient and variance estimates from Model 1.5 in Table 2. Dashed lines denote a 95 percent confidence interval. Polity, as in the original regression, has been recentered so that it ranges from 0 to 20.*

Columns 1.3 and 1.6 show the results for a model with both country and year fixed-effects but, as not all panels overlap in time, no panel-corrected standard errors. In many ways, this is the most conservative estimation strategy as it controls for both country- and time-specific influences. Nevertheless, as with the previous two specifications, the interaction coefficient is positive and statistically significant for both total and animal calories. Indeed, the magnitude of the interaction coefficient even increases slightly for both dependent variables.

In general, similar results emerge for changes in both types of calories across all models — with two exceptions. As noted above, the smaller coefficients for the interaction and its individual components in the animal calorie models may suggest that individuals turn to less expensive, i.e., non-animal, sources of nutrition first. More indirect support for this interpretation arises from the second difference: National wealth levels, logged *GDP/Cap*, prove strong and statistically significant predictors of changes in the average daily consumption of animal calories but not of total calories. Animal calories, it seems, may be a luxury. Even considering such differences, however, the similarities are more striking. In all models the marginal effect of GDP growth on calorie increases rises significantly with the *Polity* score. Regardless of which dependent variable and which specification is employed, democracy increases the proportion of economic gains that flow to the broader population.

4.1 Robustness Checks

As with all analyses, we are concerned about robustness. We have taken pains to include fixed-effects in our models to capture possible country- and even year-specific influences but this does not preclude the possibility that some observations exert inordinate leverage on the coefficient estimates. With a sample size of 3372 country-years it is unlikely that a single observation could greatly influence the coefficient estimates; specific countries, however, certainly could. Even though country fixed-effects absorb cross-country variation and isolate the dynamics, time-series in certain countries could still have a disproportional influence on the results. Consequently, to verify that our results are indeed robust we run a panel jackknife analysis for Models 1.2 and 1.5. The panel jackknife systematically removes each panel unit (i.e., country) and reestimates the model. Thus, each of the two models is run 113 times, omitting a different country in each regression. Tables 3 and 4 report the maximum and minimum value for each coefficient in Models 1.2 and 1.5, respectively, as well as the country that was omitted when it was generated. We immediately see that GDP growth does not always have a significant effect on the change in total and animal calorie intake in full autocracies. *Growth* has no significant effect on total calories in fully autocratic states when Guinea-Bissau is omitted and no significant effect on shifts in animal calories regardless of which country is excluded. Most importantly, however, the interaction of *Growth* and *Polity* remains a highly significant and strong predictor for both dependent variables in all iterations.

	Minimum Coefficient	Country Omitted at Min. Coeff.	Maximum Coefficient	Country Omitted at Max. Coeff.	All Countries (Model 1.2)
GDP/Cap	-9.567 (5.078)	Liberia	-3.817 (5.157)	S. Korea	-6.331 (4.347)
Growth	2.025 (0.358)	Guinea-Bissau	2.443 (0.373)	Libya	2.207 (0.353)
Polity	-0.219 (0.328)	Haiti	-0.029 (0.326)	Bulgaria	-0.140 (0.340)
$Grow * Pol$	0.117 (0.038)	Moldova	0.150 (0.038)	Botswana	0.135 (0.040)

Table 3: *Cross-sectional jackknife analysis of Total Calorie Model 1.2.*

	Minimum Coefficient	Country Omitted at Min. Coeff.	Maximum Coefficient	Country Omitted at Max. Coeff.	All Countries (Model 1.2)
GDP/Cap	5.122 (0.160)	China	5.961 (1.528)	Malaysia	5.556 (1.622)
Growth	0.113 (0.107)	Chile	0.188 (0.111)	Gabon	0.144 (0.105)
Polity	-0.231 (0.097)	Guyana	-0.094 (0.097)	Hungary	-0.201 (0.115)
$Grow * Pol$	0.067 (0.011)	Hungary	0.078 (0.011)	Lithuania	0.073 (0.016)

Table 4: *Cross-sectional jackknife analysis of Animal Calorie Model 1.5.*

5 Conclusions

The failure of developing countries to alleviate food insecurity and malnutrition is often described as resulting from a lack of political will (Pinstrup-Anderson 1993). While in authoritarian regimes the political will of an autocratic leader or ruling junta is often necessary to translate economic growth into practices that benefit the poor, in a democratic setting, the median voter — who is often a member of the lower-middle class — seems to enjoy some of the opportunities presented by economic growth. In this paper, we have shown that given similar rates of growth, democracies make increases in food — a commodity for which there exist natural limits on the amount any single person can consume — available at higher rates than autocracies. This finding highlights the two primary innovations of this paper. The first is the use of per capita calorie availability as a proxy for economic redistribution that benefits the poor. Collected by the United Nations' Food and Agriculture Organization, these data are nearly universally available and nicely capture a measure of basic human importance — calorie consumption. The second innovation of the paper is the focus on how democracy and growth *interact* to affect the world's poor. Previous research has failed to show that democracies grow their economies at faster rates than autocracies; while regime type may not be a good predictor of economic growth, our findings suggest that democratic government interacts with growth in ways that are good for the poor.

There are two plausible mechanisms connecting democratic government to pro-poor growth, each of which enjoys at least limited support in the existing literature. The first suggests that democracies invest more heavily in human capital than autocracies and government investment in human capital development better positions the poor to take advantage of opportunities presented by growth. The second argues that competitive elections encourage candidates, parties, and incumbent governments to woo voters with targeted rewards and that the most effective voters to target are poor voters; a growing economy creates a larger resource base from which to distribute clientelist benefits and as a result growth and democracy interact in a redistributive way. An important area of future research will be to empirically differentiate between these and other hypotheses.

References

Acemoglu, Daron and James Robinson. 2006. Economic Origins of Dictatorship and Democracy. Cambridge: Cambridge University Press.

Adetunji, Jacob. 1995. Infant Mortality Levels in Africa: Does Method of Estimation Matter? Harvard Center for Population and Development Studies. Working paper.

Aghion, P., Caroli E., and C. Garcia-Penalosa. 1999. Inequality and Economic Growth: The Perspective of the New Growth Theories. Journal of Economic Literature.

Azfar, Omar. 2005. Institutions and Poverty Reduction. IRIS, University of Maryland College Park. Working paper.

Atkinson, Anthony B. and Andrea Brandolini. 2001. Promise and Pitfalls in the Use of "Secondary" Data-Sets: Income Inequality in OECD Countries as a Case Study. Journal of Economic Literature 39(3): 771-99.

Barro, Robert J. 1997. Determinants of Economic Growth: A Cross-Country Empirical Study. Cambridge: MIT Press.

Baum, Matthew and David Lake. 2003. The Political Economy of Growth: Democracy and Human Capital. American Journal of Political Science. 43.

Bawn, Kathleen and Frances Rosenbluth. 1996. Short versus Long Coalitions: Electoral Accountability and the Size of the Public Sector. American Journal of Political Science 50(2): 251-66.

Besley, Timothy and Masayuki Kudamatsu. 2006. Health and Democracy. American Economic Review. 96(2).

Bhalla, Surjit S. 2002. Imagine There's No Country: Poverty, Inequality and Growth in the Era of Globalization. Washington, DC: Peterson Institute.

Blaydes, Lisa. 2006. Who Votes in Authoritarian Elections and Why? Determinants of Voter Turnout in Contemporary Egypt. Paper presented at the annual meeting of the American Political Science Association.

Boix, Carles. 2003. Democracy and Redistribution. Cambridge: Cambridge University Press.

Bollen, Kenneth A. and Robert W. Jackman. 1985. Political Democracy and the Size Distribution of Income. American Sociological Review 50(3): 438-57.

Bourguignon and Morrisson. 2002. Inequality among World Citizens, 1820-1992. American Economic Review. September.

Bradley, David, Evelyne Huber, Stephanie Moller, Francois Nielsen, and John D. Stephens. 2003. Distribution and Redistribution in Postindustrial Democracies. World Politics 55(2): 193-228.

Buchanan A. and K.M. Weiss. 1991. Infant Mortality in a Mexican-American Community: Laredo, Texas, 1950-1977. Social Biology. 38(3-4).

Calvo, Ernesto and Maria Victoria Murillo. 2004. Who Delivers? Partisan Clients in the Argentine Electoral Market. American Journal of Political Science. 48(4).

Chang, Eric C.C. 2007. Political Transition, Corruption, and Income Inequality in the Third-Wave Democracies. Michigan State University. Working Paper.

Deininger, Klaus and Lyn Squire. 1996. A New Data Set Measuring Income Inequality. The World Bank Economic Review 10(3): 565-91.

DeSoto Hernando. 2000. The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else. New York: Basic Books.

Dixit, Avinash and John Londregan. 1996. The Determinants of Success in Special Interests in Redistributive Politics. Journal of Politics. 58(4).

Dollar, David and Aart Kraay. 2002. Growth is Good for the Poor. Journal of Economic Growth. 7.

Durr, Robert H. 1993. What Moves Policy Sentiment? American Political Science Review 87(1): 158-72.

Epstein, David, Robert Bates, Jack Goldstone, Ida Kristensen, and Sharyn O'Halloran. 2006. Democratic Transitions. American Journal of Political Science 50 (July):551-569.

Feldstein, Martin and Charles Horioka. 1980. Domestic Saving and International Capital Flows. Economic Journal 90: 314-29.

Firebaugh, Glenn. 2003. The New Geography of Global Income Inequality. Cambridge, MA: Harvard UP.

Fogel, Robert W. 2004. The Escape from Hunger and Premature Death, 1700-2100: Europe America, and the Third World. Cambridge and New York: Cambridge University Press.

Food and Agriculture Organization (FAO). 2001. Food Balance Sheets: A Handbook. Rome: United Nations.

Haggard, Stephen. 1990. Pathways from the Periphery: The Politics of Growth in the Newly Industrializing Countries. Ithaca: Cornell University Press. Chapter 10.

Helliwell, John F. 1994. Empirical Linkages Between Democracy and Economic Growth. British Journal of Political Science. 24: 225-48.

Hogberg, David. 2006. Don't Fall Prey to Propaganda: Life Expectancy and Infant Mortality are Unreliable Measures for Comparing the U.S. Health Care System to Others. National Policy Analysis. 547.

Houle, Christian. 2008. Inequality and Democracy. Working Paper. University of Rochester.

Howell, Embry M. and Beatrice Blondel. 1994. International Infant Mortality Rates: Bias from Reporting Differences. American Journal of Public Health. 84(5).

Iversen, Torben and David Soskice. 2006. Electoral Institutions and the Politics of Coalitions: Why Some Democracies Redistribute More Than Others. American Political Science Review 100(2): 165-81.

Kayser, Mark A. 2008. Partisan Waves: International Sources of Electoral Choice. Working Paper. University of Rochester.

Kenworthy, Lane and Jonas Pontusson. 2005. Rising Inequality and the Politics of Redistribution in Affluent Countries. Perspectives on Politics 3(3): 449-71.

Knack, Stephen. 2003. Security of Property and Contract Rights and "Pro-poor" Growth. Paper presented at the Measuring Empowerment Workshop at the World Bank.

Korpi, Walter and Joakim Palme. 1998. The Paradox of Redistribution and Strategies of Equality. American Sociological Review 63.

Kraay, Aart. 2006. When is Growth Pro-poor? Evidence from a Panel of Countries. Journal of Development Economics. 80(1).

Kudamatsu, Masayuki. 2006. Has Democratization Reduced Infant Mortality in Sub-Saharan Africa? Evidence from Micro Data. London School of Economics and Political Science. Working paper.

Kuznets, Simon. 1955. Economic growth and income inequality. American Economic Review 45: 1-28.

Lake, David and Matthew Baum. 2001. The Invisible Hand of Democracy: Political Control and the Provision of Public Services. Comparative Political Studies. 34.

LeBlang, David A. 1997. Political Democracy and Economic Growth: Pooled Cross-Sectional Time-Series Evidence. British Journal of Political Science 27: 453-72.

Lindert, Peter H. 1994. The Rise of Social Spending, 1880-1930. Explorations in Economic History 31: 1-36.

Lindert, Peter H. 1996. What Limits Social Spending? Explorations in Economic History 33: 1-34.

Maier, Rolf. 2005. Exchange Rate Regimes and Pro-Poor Growth. Paper presented at the World Institute for Development Economics Research Conference June 2005, Helsinki Finland.

Meltzer, Allan and Scott Richard. 1981. A Rational Theory of the Size of Government. Journal of Political Economy. 89.

Milanovic, Branko. 2000. The Median-Voter Hypothesis, Income Inequality and Income Redistribution. European Journal of Political Economy 16.

Milesi-Ferretti, Gian, Roberto Perotti, and Massimo Rostagno. 2002. Electoral Systems and Public Spending. Quarterly Journal of Economics 117(2): 609-57.

Min, Brian. 2008. Democracy and Light: Electoral Accountability and the Provision of Public Goods. Presented at the Annual Meeting of the Midwest Political Science Association.

Moene, Karl Ove and Michael Wallerstein. 2001. Inequality, Social Insurance, and Redistribution. American Political Science Review 95(4): 859-74.

Mulligan, Casey, Ricard Gil, and Xavier Sala-i-Martin. 2004. Do Democracies Have Different Public Policies than Nondemocracies? Journal of Economic Perspectives. 18(1).

Muller, Edward N. 1988. Democracy, Economic Development, and Income Inequality. American Sociological Review. 53(1).

Pinstrup-Andersen, Per. 1993. The Political Economy of Food and Nutrition Policies. Baltimore: Johns Hopkins University Press.

Ravallion, Martin. 2004. Pro-Poor Growth: A Primer. World Bank Policy Research Working Paper 3242.

Ross, Michael. 2006. Is Democracy Good for the Poor? American Journal of Political Science. 50(4).

Sadler, Kathryn and Nuning Aknmadi, editors. 2004. Governance and Poverty Reduction. Evidence from Newly Decentralized Indonesia. SMERU Working Paper.

Scheve, Kenneth and David Stasavage. 2008. The Conscription of Wealth: Mass Warfare and the Demand for Progressive Taxation.

Sen, Binayak, Mustafa K. Mujeri, and Quazi Shahabuddin. 2004. Operationalizing Pro-Poor Growth: Bangladesh as a Case Study. World Bank Working Paper.

Sirowy and Inkeles. 1990. The Effects of Democracy on Economic Growth and Inequality: A Review. Studies in Comparative International Development 25: 126-57.

Soekirman, Ignatius Tarwotjo, Idrus Jus'at, Gunawan Sumodiningrat, and Fasli Jalal. 1992. Economic Growth, Equity and Nutritional Improvement in Indonesia. United Nations. Administrative Committee On Coordination - Subcommittee On Nutrition.

Spencer, N. 2004. The Effect of Income Inequality and Macro-level Social Policy on Infant Mortality and Low Birthweight in Developed Countries — A Preliminary Systematic Review. Child: Care, Health, and Development. 30(6).

Stasavage, David. 2005. Democracy and Education Spending in Africa. American Journal of Political Science. 49(2).

Stevenson, Randolph T. 2001. The Economy and Policy Mood: A Fundamental Dynamic of Democratic Politics? American Journal of Political Science 45(3): 620-33.

Stokes, Susan C. 2005. Perverse Accountability: A Formal Model of Machine Politics with Evidence from Argentina. American Political Science Review. 99(3).

Timmons, Jeffrey F. 2008. Does Democracy Reduce Economic Inequality? If So, How? Working Paper. UCLA and ITAM.

Wacziarg, Romain. 2001. Human Capital and Democracy. Stanford Graduate School of Business. Unpublished manuscript.

Young, Frank W. 1990. Do Some Authoritarian Governments Foster Physical Quality of Life? Social Indicators Research. 22(4).