

**"Will Vote for Food? Regime-Type and Food Consumption in the
Developing World"**

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Abstract: Competitive elections are now a common mechanism for gaining power in much of the developing world. Many scholars, politicians, and citizens expect elections to lead to improved living conditions for the masses. This paper tests the relationship between regime-type and improvements in calorie consumption. Highly cross-section dominant pooled time series regression is employed on a longitudinal data set of 173 cases. Democracy has a strong and significant effect on changes in food consumption and the relationship is U-shaped. Autocracies perform better than countries with a few years of democracy over a 15-year period. Countries with 12-15 years of democracy perform best. I also argue that change in calorie consumption is a surrogate for equity.

Hunger. It was prevalent everywhere....Hunger stared down from the smokeless chimneys, and stared up from the filthy street that had no offal, among its refuse, of anything to eat.
Charles Dickens, *A Tale of Two Cities*

While many studies in recent years have focused on the causes of democracy, far fewer have examined the domestic consequences of electoral competition in the developing world. With many Third World countries showing signs of establishing enduring electoral regimes, it may be time for a shift in focus from democracy as a dependent to a causal variable.¹ This study examines the effect of democracy on changes in food consumption in developing countries.

The transition from authoritarian to democratic regimes was widely believed by the citizens of many of these countries to usher in an era of more equitable distributions of resources and an improved standard of living for the masses. Today, more than two decades after the initiation of the Third Wave of democracy, the lack of social progress has resulted in disenchantment with democracy and apathy towards political participation in many new democracies. While we are now many years into an era of electoral regimes in Latin America, the number of Latin Americans living in poverty in that region has actually increased from 200 million in 1990 to 204 million in 1998 (ECLAC 1999). And the Sixth World Food Survey reveals the disheartening trend that the number of undernourished Latin Americans has grown from 53 million in 1969-71 to 64 million in 1990-92 (FAO, 1996).

Do relatively free and competitive elections lead to improved living conditions for the voting masses? The conventional wisdom amongst social scientists has been that democracy would empower the masses with a vote and the right to organize interest groups and that politicians would respond with anti-poverty measures while authoritarian regimes could more easily repress demands for better housing, education, wages, or nutrition. The May 1998 Philippine elections featured an explicit quid pro quo with the winning presidential candidate promising a redistribution of resources if the masses would just

give him their vote. Hugo Chávez Frias won the December 1998 presidential elections in Venezuela in part by promising to take from the rich and give to the poor and to use the country's oil wealth to meet the basic needs of the people. Over time, democracies should exhibit greater levels of egalitarianism and the masses should experience an improvement in their standard of living. The causal linkage between competitive elections and government efforts to improve the material well-being of the masses is simple--politicians want to remain in power and where the poor are a majority of voters, elected officials have a strong incentive to improve the living conditions of the poor. The expectation that democracy would benefit the masses is frequently incorporated into social science research. Linz argues that electoral democracy is worth studying and a desirable goal as political democracy will slowly lead to social equality (1978, 96-97). Barro (1997, 59) explains the finding that low levels of democracy are good for economic growth while high levels of democracy impede economic growth by positing that the dominant effect of higher levels of democracy is "intensified concern with income redistribution."² Muller (1988, 1995) argues that extreme inequalities in the size distribution of income will lead to breakdowns of democracy as the redistributive effects of electoral competition threaten the interests of the oligarchy. Lake and Baum (1998) contend that democracies will produce larger quantities of public goods than autocracies as the costs of removing politicians from office are lower in electoral regimes. And Hunter and Brown (1998) find that democracies spend more on social programs than do authoritarian regimes and posit that this results from the fact that the poor make up a large share of the electorate in developing countries and elected governments' priorities center on welfare-enhancing programs. In contrast, other scholars such as Gills, Rocamora, and Wilson (1993) counter that current forms of Third World polyarchy produce "low intensity democracy" that instead of redistributing power and resources ends up legitimizing the status quo. One may also argue that LDCs

have little economic autonomy in our globalized world and regardless of regime-type will follow economic prescriptions mandated by international money doctors.

What does comparative quantitative research tell us about the relationship between democracy and food consumption/equity? While I could find no large-N studies that directly evaluate the relationship between democracy and food consumption, Ravallion (1997, 1225) argues that democratization and freer information flows reduce hunger associated with famine and Sen (1999) has written extensively on the political causes of undernutrition and starvation.³ Studies on the relationship between democracy and income distribution are more common, but have resulted in more confusion than answers. In a recent review of the relevant literature, Hughes (1997, 1101) reports that nine studies find a negative relationship between democracy and income distribution, thirteen studies find no relationship, and five studies show that democracy actually causes higher levels of inequality. Sirowy and Inkeles (1991) also lament the confusion of extant research, encourage more work on the topic, and--noting the shortcomings of income distribution data--suggest that researchers should focus on those alternative indicators of social and economic welfare that also capture elements of distribution.

This suggestion has been followed by Chan's examination of democracy and social spending in East Asia (1997) and Gasiorowski's research on industrial wage levels (1997). Chan lists some of the challenges for establishing the relationship between democracy and equality, which include:

The search for any association between democracy and equality faces a formidable obstacle due to the long (and usually unspecified) lag that is likely to separate the initial changes in political condition (the imputed cause) from the subsequent changes in social distribution (the ostensible effect). The relevant changes for both sets of variables are often slow and incremental, and longitudinal data for the latter are usually unavailable.(1997, 243).

While these challenges (and others listed by Seligson 1993, 442-444) are daunting, the question of the relationship between democracy and equality is more important than ever as large numbers of

LDCs with high levels of social inequality are consolidating electoral regimes. This study is an empirical examination of this important relationship using a different indicator of social welfare and longitudinal data.

Food Consumption: The Dependent Variable

The greatest impediment to resolving the issue of the relationship between democracy and equity is the quantity and quality of data for income distribution in LDCs. Reliable longitudinal data for a large number of developing countries over a similar time period are just not available. Deininger and Squire assess the existing data and create an exhaustive new dataset for income distribution, which reveals that even economically advanced LDCs such as Argentina and Uruguay not only have no acceptable longitudinal data but have no acceptable data for income distribution for any single year (1996). Indeed, only nine of the twenty Latin American countries have longitudinal income distribution data of an "acceptable quality." In this study, I have opted for an alternative indicator--change in calorie consumption per person per day.⁴ Not only is food consumption an important dependent variable, this indicator also fits the admonition of Sirowy and Inkeles (1991) of seeking alternative measures of social welfare that capture an element of distribution.

Changes in calories per person per day is an indicator that possesses many desirable qualities. First of all, Paul Streeten (1981) has led the intellectual charge that development should focus on "first things first" and a basic needs approach. There is nothing more basic than food.⁵ We cannot brag about democracy and economic growth and literacy rates if large numbers of children go to bed hungry. The centrality of food for a large number of inhabitants in the developing world is captured by John Mellor of the Food Policy Research Institute.

Food is emotional, political, life threatening. Naturally, it fills the cultural outlook and colors the life for the half-billion rich people in the world. But the quest for food and the worry as to how that quest will fare bear with terrible immediacy on well over 1 billion

people, the hungry and the undernourished. It is central to the worries of another billion or two who are at risk of falling into the ranks of the hungry or who, having only recently reasonably ensured their departure from those ranks, remember hunger all too well. (1999, ix).

Malnutrition is the leading killer in the world and undernutrition is the principal malnutrition problem (Foster and Leathers 1999, xiv). And, while protein deficiency can and does occur, evidence shows that even poor people who consume sufficient calories adapt their diets to consume adequate grams of protein. Therefore, it is common to find people with both calorie and protein deficiencies and with calorie deficiency but not protein deficiency. Yet, it is difficult to find people with a protein deficiency without a calorie deficiency (Foster and Leathers 1999, 28). Therefore, calorie consumption is a single indicator that captures the hunger, undernourishment, and malnutrition that plagues a billion people.

Second, change in calories per person per day captures an element of distribution and it may be argued that it is a surrogate for resource distribution or equity. The wealthy are always going to eat. However, unlike income, they can generally only eat so much so the indicator has a declining marginal utility. Therefore, to have high calories per person per day (a mean average) for a country, the working class and popular sectors must also consume a relatively high number of calories. If 30 or 40 percent of the population are undernourished, it will bring down the average number of calories for the entire country no matter how rich the rich get. Since food consumption for the upper quintile of the population is assumed to be relatively stable, change in average number of calories per day will be a result of changes in the food consumption for the rest of the population. If the average number of calories per person per day is increasing, the lower quintiles are eating more and approaching food equity with the higher quintiles. If the average number of calories is decreasing, then the lower quintiles are eating less and the gap between calories consumed by the rich and those consumed by the poor is widening. This would provide some indication of an unequal distribution of resources/income. At least in the case of

Chile, data revealing a surprising decline in the number of calories per person from 1969 to 1989 preceded and I would argue predicted the later disclosure of a shocking deterioration in the distribution of income over the same time period (Schneider 1993; Psacharopoulos et al. 1993). Foster and Leathers (1999 Ch. 9) document the strong relationship between income distribution and food consumption. And Reutlinger and Selowsky (1976, 20) reveal that there is a direct linear relationship between income share and food consumption in Latin America.

Third, we have comprehensive data for calorie consumption for a large sample of LDCs for a period of time that captures enduring and not merely transient change. This same series of data is unavailable for income distribution. Studies using income distribution as a dependent variable are often forced to use "snapshot" cross-sectional studies that are highly susceptible to simultaneity and spuriousness problems and have produced misleading confidence in the Kuznets U-Curve for LDCs (Bowman 1997, 128-129). In contrast, the FAO provides comparable data on food consumption in comparable years for a large sample of LDCs and with enough datapoints over time to capture change. For this study, I have identified 173 LDC cases that have longitudinal calorie consumption data over approximately 15 years.

Fourth and finally, governments should be able to affect policies that assure improved nutrition for the majority of its citizens. If large numbers of children go to bed hungry in modern Latin America for example, there is something wrong with the long-term quality of government. While nutrition and food consumption is a complicated issue, experts understand the "processes which in a generation can abolish hunger and undernutrition" (Mellor 1999, x). Yet, hunger is a reality in all Third World regions. Some 50% of Central Americans do not eat enough food to meet minimal nutritional requirements (Barry and Preusch 1986, 140). Even in Latin America's wealthiest country, Argentina, the face of hunger caused national embarrassment when the international press showed videos of poor families

grilling cats and complaining of hunger. There are many policy alternatives for improving food consumption, and a debate on these policies is well beyond the scope of this paper.

In this study, change in calorie consumption over two (approximately) fifteen-year periods is employed as the dependent variable; circa 1960-1974 and circa 1975-1989, and is labeled "CALSX15."

Electoral Democracy: The Causal Variable

There are many indicators and scales of democracy. Some scholars have developed a dichotomous or trichotomous measure while others have employed techniques to produce ordinal and interval level scales. The operationalization of democracy has produced one of the more heated recent battles in political science where Bollen and Jackman (1989) lead the charge for a graded measure while Sartori (1987) and Przeworski and Limongi (1997) counter that there is no such thing as being half-pregnant or half-democratic and that the proper operationalization is dichotomous. Collier and Adcock (1999) carefully examine the issue and conclude that the choice of a graded or dichotomous scale should not be made *ex ante*, but rather should be determined by the goals and context of the research. In this study, I am not interested in the relationship between quality of democracy and changes in food consumption, but specifically whether having competitive elections alone makes a difference for the masses. The theoretical causal linkage proposed by Lake and Baum (1998), Hunter and Rice (1998) and others is simply that the power of the masses to vote politicians in and out of office results in redistributive measures by elected officials. The quality of democracy beyond relatively competitive elections is not part of the theoretical causal mechanism and therefore should not part of the empirical models.⁶ In addition, if one agrees that the impact of democracy on inequality or another social indicator is gradual, then little can be gained by employing measures of level of democracy

(Muller 1988, 51; Hewitt 1977, 456-457). The appropriate operationalizing of democracy is a scale of number of years democratic where the electoral game is in play.

For this study, I first constructed a dichotomous data-set based largely on the Gasiorowski Political Regime Change Dataset (1996).⁷ The data were coded such that each case would receive a "1" for each year (at least six months and one day) over a fifteen-year period (1960-1974 or 1975-1989) with a government selected through competitive elections and a "0" for each year without electoral democracy.⁸ Each case would have a score for the period of between "0" and "15". For example, Mexico 1960-1974 does not meet the minimal requirements for competitive elections and has a score of "0". Costa Rica has a democracy score of 15 for each time period. Honduras was an electoral democracy from December 1957 to October 1963, was authoritarian from October 1963 to January 1982, and an electoral democracy after January 1982; and therefore has a score of "4" for the 1960-74 period and "8" for the 1975-89 period.⁹ This coding procedure was applied to the entire sample of LDCs with a population of more than one million. The sample is restricted to the developing world because while undernourishment affects approximately one billion people throughout the developing world,¹⁰ undernourishment has been largely vanquished in the advanced industrial countries.

The Hypotheses, the Control Variables, and the Empirical Model

Hewitt (1977), Muller (1988), and Barro (1997) propose that democracy only leads to egalitarian pressures slowly or in large doses and suggest that the relationship between democracy and equality is non-monotonic. Simpson (1990) and Burkhart (1997) find an inverted-U relationship between democracy and income distribution. The bivariate relationship between number of years of democracy and changes in calorie consumption also exhibits a U-shape as illustrated in Table 1.

<insert Table 1 about here>

This paper will test three hypotheses with multivariate analysis:

H1: More years democratic results in more calories per person

H2: More years democratic results in fewer calories per person

H3: The relationship is a second-order polynomial function where low and high values of number of years democratic results in more calories per person while mid-levels of number of years democratic result in fewer calories (a U-shape).

Muller suggests that income distribution data are relatively stable for up to eleven years (1988). With this in mind, our models will attempt to assess the relationship over a long enough period of time to establish a secular relationship without confusion from more transient changes; an admonition made by Kuznets for studies of equity (1954, 153). Cross-sectional models will explore the relationship between the levels of the independent variables and the change in the dependent variable over a 15-year time period. This type of model is similar to that used by Bullock and Firebaugh (1990) except that they use a 20-year time period. I chose the 15-year period simply because it permitted two time periods per country with the available data.

Modeling change over a long period of time in cross-sections is increasingly common in economic studies of development. The highly influential work of Barro (1991) assesses change in economic growth over a 25-year period in cross-sections, and Quinn notes that the cross-sectional regression model used by Barro and others "has been well examined in the literature and is appropriate for studying long-run trends," precisely what I am interested in (Quinn 1997, 536).

In the multivariate analysis, various control variables will be employed. These include:
CALS1: number of calories per person per day at the beginning of each 15-year period. It is likely that the dependent variable will exhibit regression towards the mean and that increases in food consumption will be easier if the beginning level is lower. These data come from the FAO Production Yearbook.

PCGDPYR1: This is the per capita wealth at the beginning of the period. Wealthier countries may have greater organizational resources to promote food policy. Wealthier countries also have surplus that can more easily be redistributed. These data are from Mark 5.6 of the Penn World Tables.¹¹

%GDPGRW: The percentage of economic growth per capita over a fifteen year period (1960-1974 or 1975-1989). From the Penn World Tables Mark 5.6.

TIME1: This is a dummy variable to hold constant the two 15-year periods coded "1" for period 1 and "0" for period 2. The two time periods may have distinct dynamics as the second period includes the "lost decade" for much of the Third World, the debt crisis, and structural adjustment programs.

OPEN: The openness of the economy. The mean average over fifteen years of the (exports + imports) / GDP. An open economy on one hand may lead to better and cheaper access to food and less inefficient agricultural policy (Cohen 1998, 7-9), while on the other hand an open economy may impact the incentives of small farmers to produce food for consumption as opposed to goods for export. From the Penn World Tables.

MPR: This is the military participation ratio or the number of soldiers per 1,000 inhabitants. Various scholars including Bullock and Firebaugh (1990), Dixon and Moon (1986) and Weede (1986) contend that large militaries as measured by numbers of soldiers are schools of the nation and modernizing forces that improve social welfare, income distribution, and food consumption. Data from ACDA (Arms Control and Development Agency). For the first time period, MPR is the mean average number of soldiers per thousand inhabitants 1963-1974 and for the second period it is the mean average 1975-1989 (data are unavailable for 1960-62).

HUMANCAP: This is a score for level of human capital within society. The greater the level of human capital, the greater the expectation that economic growth could result in higher paying jobs and increased food consumption for the popular classes. The indicator is the average years of schooling in

the total population over age twenty-five at year one of the time period (1960 or 1975) and is from the Barro-Lee Dataset on floppy.

POLINST: This is a measure of political instability and equals (.5 * number of assassinations per million population per year + .5 * number of revolutions per year), which is then averaged over the 15 year period. Source is Barro-Lee Dataset on floppy.

The full regression model is specified as:

$$\text{CALSX15} = a1 + b1(\text{democracy}) + b2(\text{democracy}^2) + b3(\text{cals1}) + b4(\text{pcgdp1yr}) + b5(\% \text{gdp grow}) \\ + b6(\text{dummy time1}) + b7(\text{openecon}) + b8(\text{mpr}) + b9(\text{humcap}) + b10(\text{polinstab}) + e$$

This study includes all LDCs with a minimum population of one million. The multivariate analysis employs ordinary least squares and stacks two cases per country where data are available. This is pooled time-series data but extremely cross-sectional dominant (75 cases (N) X 2 times (T)), virtually eliminating threats of autocorrelation that plagues OLS estimators of pooled time-series data.¹²

The Findings and Discussion

<insert Table 2 about here>

The regressions are presented in Table 2. The dependent variable and basic model remain the same in all four equations. In the first three equations, both democracy and a quadratic (democracy squared) are included and the results strongly support Hypothesis 3 of a significant non-linear relationship between years of democracy over a 15-year period and change in calorie consumption per person per day.¹³ The pattern of the results, a negative coefficient for the linear term and a positive coefficient for the squared term, means that a few years of democratic rule negatively affects caloric change while increasing years of democratic rule over a 15-year period positively impact the change in the number of calories per person. This is a U-curve relationship and is illustrated in Figure 1.¹⁴ With and without holding constant various control variables, citizens of countries with a few years of

democracy will expect to consume fewer calories per person than citizens of both countries with no years of democracy and countries with many years of democracy.¹⁵

The balance of the control variables can be briefly interpreted as follows. The original level of calories had the expected negative and significant impact on change in calories. The lower the original level, the faster the growth. Original level of PCGDP is also highly significant and with the expected sign.¹⁶ The wealthier a country, the faster the growth in calories even when holding constant economic growth and original level of calorie consumption. This suggests that wealthier states have greater capacity to implement social policy, which may derive from better infrastructure, thicker civil society, or more effective governing institutions. The growth of the economy is also highly significant and positive, and any other finding would be quite surprising. For every one-percent growth of the economy over a 15-year period, the number of calories per person increases by 3.03 (Equation 2.1). This supports recent research by Squire and Deininger that the poor generally benefit from economic growth (1997, 41). Economic growth is especially important for increased food consumption as there is a direct impact of growth and an indirect impact of a higher level of initial level of PCGDP for subsequent periods.

Five of the control variables have little if any impact on change in calorie consumption. The dummy variable for time period 1 is negative in Equation 2.1, 2.2, and 2.4, yet only significant in 2.1 where countries had an 86.92 calorie lower growth rate in 1960-74 than in 1975-89. The openness of the economy is negative in the first two equations but only significant in the first, and changes signs in Equation 2.4. Certainly, the belief that closed economies result in inefficient agricultural policies and hunger is not sustained; the evidence is weak but for the opposite view that open economies lead to export-based agriculture and greater hunger at home (Conroy et al, 1996). The size of the military as measured by number of soldiers per 1,000 inhabitants has no significant effect in any equation.

Human capital and political instability are only included in Equation 2.1 as their inclusion greatly reduces the sample size (from 134 to 96 cases). Holding the other eight variables constant, neither human capital nor political instability makes any significant difference.

These equations explain just under one-third of the variance in the change in calorie consumption. While the equations themselves are highly significant and an R2 of .321 is important, there is clearly still a lot of the variance that is not explained by this model. Weather patterns, technology diffusion, and demographic changes are all other variables that could potentially impact change in calorie consumption.

When democracy is entered linearly into the regression system, the resulting coefficient always turns out to be insignificant. I report only one such regression, which is reported in Equation 2.4. Hypotheses 1 and 2 are rejected while Hypothesis 3 is confirmed.

<insert Figure 1 about here>

The effect of years of democracy on change in calories established in Equations 2.1 through 2.3 are illustrated in Figure 1. For each equation, the predicted values of change in calorie consumption given a specified number of years of democracy were generated assuming the mean value for each control variable. Each of the three equations provides a similar U-shaped pattern. For the first four to five years of electoral democracy, every additional year of democracy results in fewer additional calories per person per day. After bottoming out at four to five years, each additional year of democracy results in more calories. However, it takes some eight to eleven years of democracy over a fifteen-year period before we can expect the citizens to consume as many additional calories as in a country with zero years of democracy. Citizens in countries with twelve or more years of democracy in a fifteen-year period can expect to consume considerably more calories than would citizens in autocracies. And, these models predict that each person in a stable democracy over 15 years will

consume between 181 and 322 more calories per day than would each person in countries with zero years of electoral democracy.

Relatively competitive elections do make a dramatic and significant difference for enfranchised citizens. However, the impact is neither linear nor always positive. The transition to democracy may be associated with a decline in the growth of calorie consumption for several years. Transitions to electoral democracy often lead to a very arduous period, often fraught with democratic reversals, aggressive posturing and wars, and volatile mass politics (Mansfield and Snyder 1995, 301). In addition, transitions to democracy also often result in long periods of institution-building and bureaucratic reorganization. In the case of Honduras, for example, electoral democracy returned in 1982. In the first 15-years after the return to democracy, the priority of the government was not an improvement of the lives of the masses, but rather the wrestling of the institutions of the state away from the armed forces. In Argentina, the military regime imploded after the Falklands debacle in 1982. The democratically-elected government of Raul Alfonsín was largely preoccupied with resolving the issues of retributive justice related to the atrocities of the dirty war and government focus on economic and material matters could only emerge in the 1990s. And the government of Nelson Mandela in South Africa largely put off issues of social progress and basic human needs, concerned primarily with the transition away from apartheid. The honeymoon with democracy appears to be ending in the country and expectations of the masses are high for president-elect Thabo Mbeki to improve living conditions. The threat is that if the poor do not see an improvement in their quality of life, the ruling African National Congress will be punished at the polls in the future.

The results of this study also indicate that autocratic regimes are often quite capable of delivering material benefits to the masses. Models and theories that propose that elections create far more incentives for redistributive measures than do non-democracies may be underestimating the

mechanisms of interest representation and political pressure available in many autocratic regimes. In many Middle East countries with no history of democratic elections, mass interests and demands can be channeled through clan or religious conduits. And, food riots and other forms of collective political action break out in the region when the masses want to exert pressures on their leaders (Bowman and Green 1997).

Conclusion

For many years, comparative political studies of the developing world have devoted a large portion of research on the causes of democracy. The conventional wisdom and the belief of the citizens of newly-democratizing countries were often that political democracy would lead to reductions in inequalities and improvements in the living standards of the masses. Social scientists have begun to examine the relationship between regime-type and material outcomes. It has been difficult to assess the relationship between electoral democracy and the size distribution of income as longitudinal data for income distribution are wanting. Sirowy and Inkeles suggest that an alternative strategy is to utilize dependent variables that are indicators of social welfare and that also capture elements of distribution.

This study proposes change in number of calories per person per day is an important dependent variable because a) there are longitudinal data for many countries, b) it captures an element of distribution, and c) it is an important indicator even if it were not a surrogate for resource distribution. Multivariate analysis suggests that best way to improve caloric intake is to grow the economy. This is important in two ways. First, growth itself is associated with higher numbers of calories. Second, countries at higher levels of economic development (which results from growth), regardless of levels of growth, are able to increase the numbers of calories per person per day. The impact of democracy is significant and dramatic, but non-linear. A few years of democracy negatively affects the calories per person per day while more years of democracy positively affects calorie consumption. It takes between

eight and eleven years of democracy over a fifteen year period before a country can expect to have the same increase in calorie consumption per person as in a country with zero years of electoral democracy. Citizens in countries with twelve to fifteen years of democracy will consume far more calories than those in autocracies or those with a few years of democracy. Finally, while in the long-term democracy clearly performs best, the evidence suggests that rulers in autocracies have many non-electoral incentives to improve the living standards of the masses.

Table 1: Democracy and 15-Year Caloric Change

Democracy Years Over 15-Year Period	Mean Change in Calories per Person per Day Over 15 Year Period	Number of Cases
Zero	157.27	73
1-5	81.22	36
6-12	135.07	14
13-15	196.08	24
total	142.87	147

Table 2: Calorie Change Regressed against Democracy^a

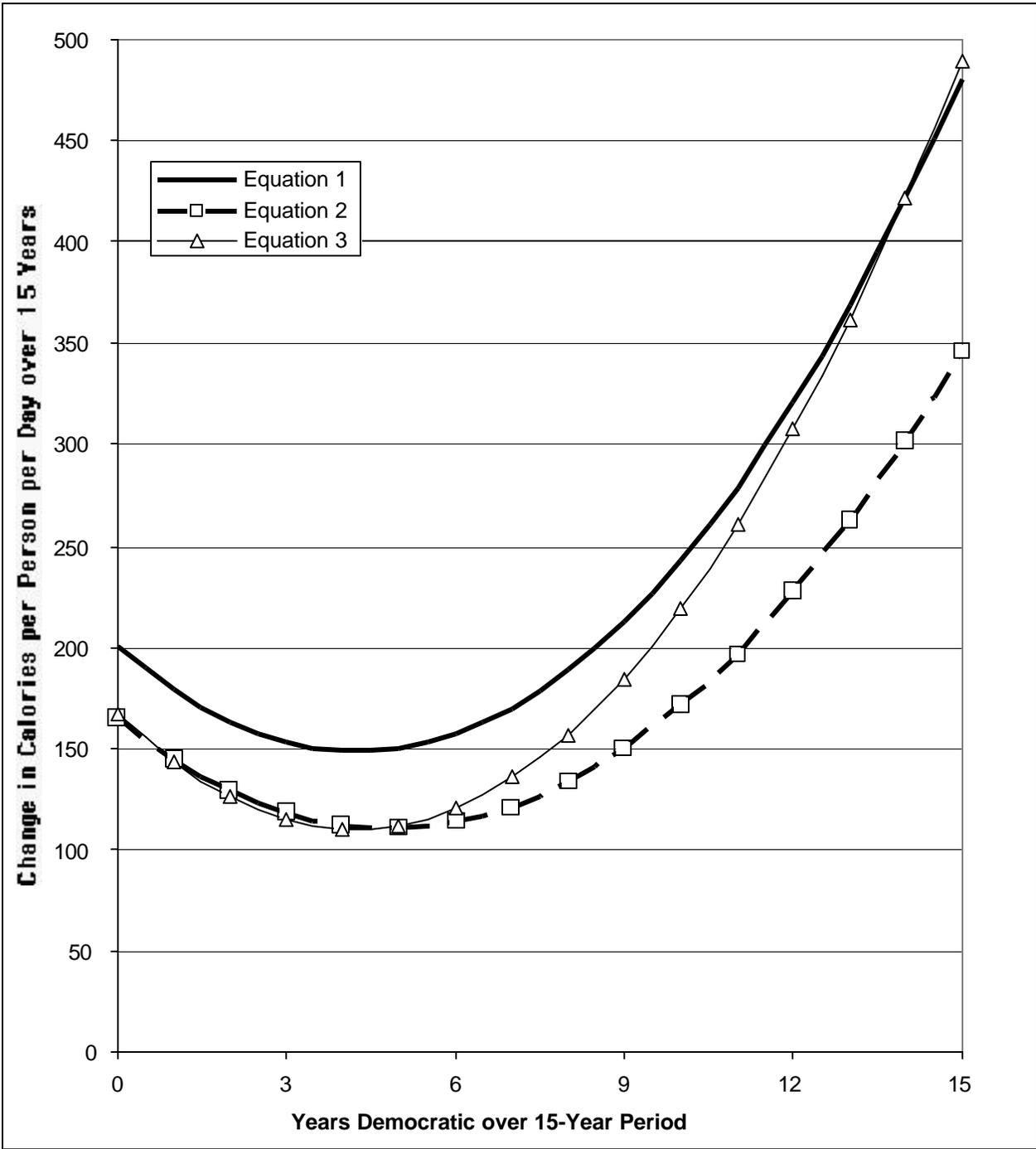
Equation	2.1	2.2	2.3	2.4	2.5
N-Size	96	134	139	147	139
Dependent Variable	CALSX15	CALSX15	CALSX15	CALSX15	CALSX15
Intercept	630.96	818.62	718.14	155.17	695.19
DEMOCRACY	-24.67 (1.63)	-22.29* (1.76)	-27.42** (2.12)	-23.38* (1.71)	-2.03 (0.62)
DEMOCRCYSQ	1.70* (1.75)	1.51* (1.82)	1.80** (2.17)	1.79** (2.01)	
CALS1	-0.24** (2.03)	-0.37*** (4.07)	-0.32*** (3.68)		-0.32*** (3.63)
PCGDPYR1	0.05 ** (2.10)	0.05*** (2.97)	0.06*** (3.69)		175.40*** (3.15)
%GDPGROW	292.64*** (4.61)	160.60** (2.43)	173.81*** (3.13)		0.06*** (3.91)
TIME1	-88.02* (1.93)	-27.06 (0.73)			
OPENECON	-0.77** (2.32)	-0.01 (0.01)			
MPR	4.61 (1.14)	5.35 (1.31)			
HUMCAP	-21.62 (0.94)				
POLINSTAB	-34.73 (0.24)				
R ²	.313	.303	.277	.024	.256
F-ratio	4.25	3.54	5.00	2.61	5.24
F-probability	.0001	.0010	.0003	.077	.0006

^aWhite's heteroscedasticity-consistent "robust" standard errors were employed

*** $p < 0.01$, two-tailed test, ** $p < 0.05$, * $p < 0.10$ Coefficients in first cell rows; t -ratios in parentheses

Variables: CALSX15 change in number of calories per person per day over 15 year period
 DEMOCRACY number of years democratic over 15 year period
 DEMOCRCYSQ DEMOCRACY squared
 CALS1 number of calories per person per day at beginning of 15 year period (1960, 1974)
 PCGDPYR1 real per capita gdp at beginning of period, 1985 purchasing parity dollars (PWT)
 %GDPGROW percentage growth of per capita gdp over 15 year period (PWT)
 TIME1 Dummy variable coded 1 for 1960-74 period and 0 for 1975-89 period
 OPENECON average exports + imports / gdp for 15 year period (PWT)
 MPR average number of soldiers per 1,000 inhabitants, 1963-74 or 1975-89
 HUMANCAP # years primary + secondary school age 25+ at beginning of period
 POLINSTAB average # assassinations and number of revolutions over 15 year period

Figure 1: Predicted Values of Change in Calorie Consumption for Different Values of Years Democratic



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NOTES

¹ The one area with a large body of scholarship is that dealing with the international consequences of electoral regimes and the democratic peace proposal. There has also been considerable research on the relationship between democracy, government economic policy, and economic growth. For example, Remmer (1990) shows that in Latin America, regime-type has no effect on government policies dealing with the debt crisis. Research on the effect of democracy on economic growth is highly inconclusive, as is the rest of the economic growth literature. Levine and Renelt (1992) show that of the more than 50 variables that have been found to be significantly correlated with economic growth, only share of investment to GDP is robustly correlated with economic growth.

² While this paper looks specifically at the relationship between democracy and food consumption, it is impossible to separate food consumption from issues of inequality and distribution. Foster and Leathers (1999, Chapter 9) and Reutlinger and Selowsky (1976) argue convincingly that hunger and low calorie consumption are a direct result of income inequality.

³ Nobel Economics Prize winner Amartya Kumar Sen was profoundly affected by the 1943 Bengali famine. One thrust of his work is that democratic, transparent governance can ameliorate hunger and stop famine (see Sen 1999).

⁴ Food consumption data come from the FAO and are generated through measurements of total food supply (see FAO 1996).

⁵ I am quite cognizant of the fact that a mere increase in calories does not translate directly into improved health and nutrition. Nevertheless, I maintain that almost all the countries in this study had a large number of inhabitants in 1960 that were undernourished in numbers of calories. And undernutrition is the single most important indicator of hunger or malnutrition.

⁶ This is not to argue that quality of democracy is unimportant per se and an analysis of the relationship between quality of democracy and equity may be a valuable future study as long as there is an explanation of the causal mechanism of why democracy matters beyond relatively free and competitive elections.

⁷ The Polity IIID dataset was dismissed because of highly questionable codings for the two cases I know the most about, Costa Rica and Honduras. I chose the Gasioworski dataset over that of Cheibub because the latter had a somewhat higher threshold for electoral democracy than that required by the theoretical explanation of the causal mechanism employed in this paper.

⁸ Gasioworski has four categories in his scale, Democratic, Semidemocratic, Authoritarian, and Transitional. His minimal requirements for “Semidemocratic” match the minimal requirements for competitive elections that theoretically should lead to vote-seeking induced redistributive pressures. This made my coding very simple. A Semidemocratic or Democratic regime in a given year would receive a “1”, Authoritarian or Transitional would receive a “0”.

⁹ The democracy score distribution was highly skewed and was logged. See note 13.

¹⁰ According to the Sixth World Food Survey (FAO 1996), between twelve and forty-three percent of the population is undernourished in different regions of the developing world.

¹¹ Mark 5.6 of the Penn World Tables displays a set of national accounts of economic time series that extend in some cases from 1950-1992. The unique feature of the PWT is that its expenditure series are denominated in a common set of prices in a common currency so that real international quantity comparisons can be made both between countries and over time (Summers and Heston 1991). These data were downloaded from the ([HTTP://WWW.NBER.ORG/PWT56.HTML](http://www.nber.org/pwt56.html)).

¹²Autocorrelation results in unbiased and consistent OLS estimators but which are inefficient and produce inflated variance of estimates of coefficients. The threat is the underestimation of standard errors and the overestimation of levels of significance.

¹³Social scientists regularly transform highly skewed data (such as GDP) to improve the fit of the regression. In this dataset, which does not include Advanced Industrial Nations, there is no evidence of skewed data for the GDP indicator, and it therefore not logged. However, there is considerable skewness in the democracy data with a many cases concentrated at the low end of the continuum. This results in a distribution that substantially deviates from a normal distribution. Following Tufte's (1974, 108) solution for highly skewed data distributions, I transformed the original democracy scores into logarithms.

¹⁴ One referee suggests that the shape is would be more accurately described as a J-curve.

¹⁵ Various regression diagnostics available in the SYSTAT and STATA statistical programs were used, including the studentized residual, leverage, the Cook statistic, and partial regression plots. Seven cases were identified as outliers or exerting high levels of influence. Pruning these cases from the sample results in no significant changes in the regression results and only moderate improvements in the R2.

¹⁶ Studies on the democracy/equity relationship have often employed a squared term for the GDP figure because of the paradigmatic nature of the Kuznets inverted-U effect. Recent studies, however, have demonstrated rather conclusively that the Kuznets effect does not obtain for LDCs (Bowman 1997, Deininger and Squire 1997). I found no evidence of a non-linear relationship between the economic variables (PCGDPYR1 and %GDPGROW) and change in calorie consumption.