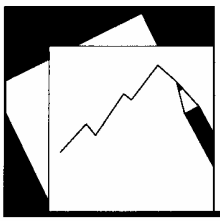
WP/05/28



IMF Working Paper

Inequality, Poverty, and Growth: Cross-Country Evidence

Garbis Iradian

INTERNATIONAL MONETARY FUND

 WP/05/28

IMF Working Paper

Middle East and Central Asia Department

Inequality, Poverty, and Growth: Cross-Country Evidence

Prepared by Garbis Iradian[1]

Authorized for distribution by J. Erik De Vrijer

February 2005

Abstract

This paper examines the empirical relationship between inequality and growth, and analyzes the impacts of growth, inequality, and government spending on poverty reduction. A new panel dataset has been assembled on inequality and poverty that reduces measurement error and ensures comparability across countries and over time. The empirical results in this paper challenge the belief that income inequality has a negative effect on growth and confirm the validity of the Kuznets curve. Credit market imperfections in low- and medium-income countries are identified as the likely reason for the positive link between inequality and growth over the short-to-medium term. In the long term, inequality may have an adverse impact on growth.

JEL Classification Numbers: O40, O15, O47, G20

Keywords: Inequality, growth, poverty, and public expenditure

Author(s) E-Mail Address: giradian@imf.org

[1] I would like to thank Jean Le Dem, Erik De Vrijer, Amor Tahari, Sena Eken, and Mohsin Khan for helpful comments and suggestions. All remaining errors are mine.

Contents Page

I. INTRODUCTION

Poverty alleviation and equity considerations are playing an increasingly important role in the work of the International Monetary Fund (IMF). This is because it is socially unacceptable to have poverty in the midst of prosperity and because equitable adjustment programs are more likely to be sustainable.[2] In this regard, efforts are being made to increase the use of poverty and social-impact analysis techniques for the assessment of the impact of policy reforms on income distribution. These reforms are supported in the programs of the IMF, notably under the Poverty Reduction and Growth Facility (PRGF).

This paper analyzes the impact of income inequality on growth, in addition to testing the validity of the Kuznets curve, according to which income inequality rises with per capita income to a certain level and declines thereafter. It also examines the relationship among economic growth, income distribution, government spending, and poverty reduction. The paper attempts to respond to the following questions:

- Is inequality harmful for growth?
- Is inequality related to the level of per capita income (Kuznets curve)?
- How responsive is poverty to economic growth and changes in inequality?
- Would an increase in government expenditures reduce the incidence of poverty and improve the income distribution?
- What is the minimum annual per capita real GDP growth needed for sub-Saharan African countries to reach their respective poverty targets, under the Millennium Development Goals, by 2015?

I use a new dataset on inequality and poverty. With that, I apply appropriate econometric techniques which address the potential biases induced by simultaneity, omitted variables, and unobserved country-specific effects—all of which have plagued previous empirical work on the links among growth, inequality, and poverty. A panel dataset for 82 countries for the period 1965–2003 has been assembled with the data averaged over periods of three to seven years, depending on the availability of inequality and poverty data. The minimum number of observations for each country is three and the maximum, seven. That is, only countries with observations for at least three consecutive periods are included. In the dataset, two household surveys for one country define what is called an interval of three to seven years in length. The entire sample includes 380 observations and 290 intervals.

Poverty in this paper is measured using the World Bank's definition, that is, the percentage of the population living on less than $1 a day at 1993 prices, adjusted for purchasing power

[2] Tanzi, Chu, and Gupta (1999), p. 13.

parity. For a few developing countries, the national household surveys' definition of poverty is used. As to the measure of income distribution, I use the Gini coefficient, which is one of the most popular representations of income inequality. It is based on the Lorenz curve, which plots the share of population against the share of income received and has a minimum value of 0 (reflecting perfect equality) and a maximum value of 1 (reflecting total inequality).

The paper is structured as follows. Section II reviews analytical arguments and the related literature regarding the relationship among growth, inequality, poverty, and government spending. Section III presents data issues and suggests using more consistent data to reduce measurement error. Section IV analyzes and evaluates the panel regression results. Section V discusses the feasibility of the Millennium Development Goals of poverty reduction in light of the estimated growth elasticity of poverty. Section VI summarizes the empirical results. Appendix I describes the empirical methodology, and Appendix II reports the complete dataset used in this paper.

The empirical results in this paper challenge the belief that income inequality has a negative effect on growth and confirm the validity of the Kuznets curve. The paper identifies credit market imperfections in low- and medium-income countries as the likely reason for the positive link between inequality and growth over the short-to-medium term. The results also find evidence that higher government spending has a statistically significant impact on reducing inequality and poverty. Data quality, period length, and estimation technique may explain why the results in this paper are different from previous studies.

II. THEORY AND EVIDENCE

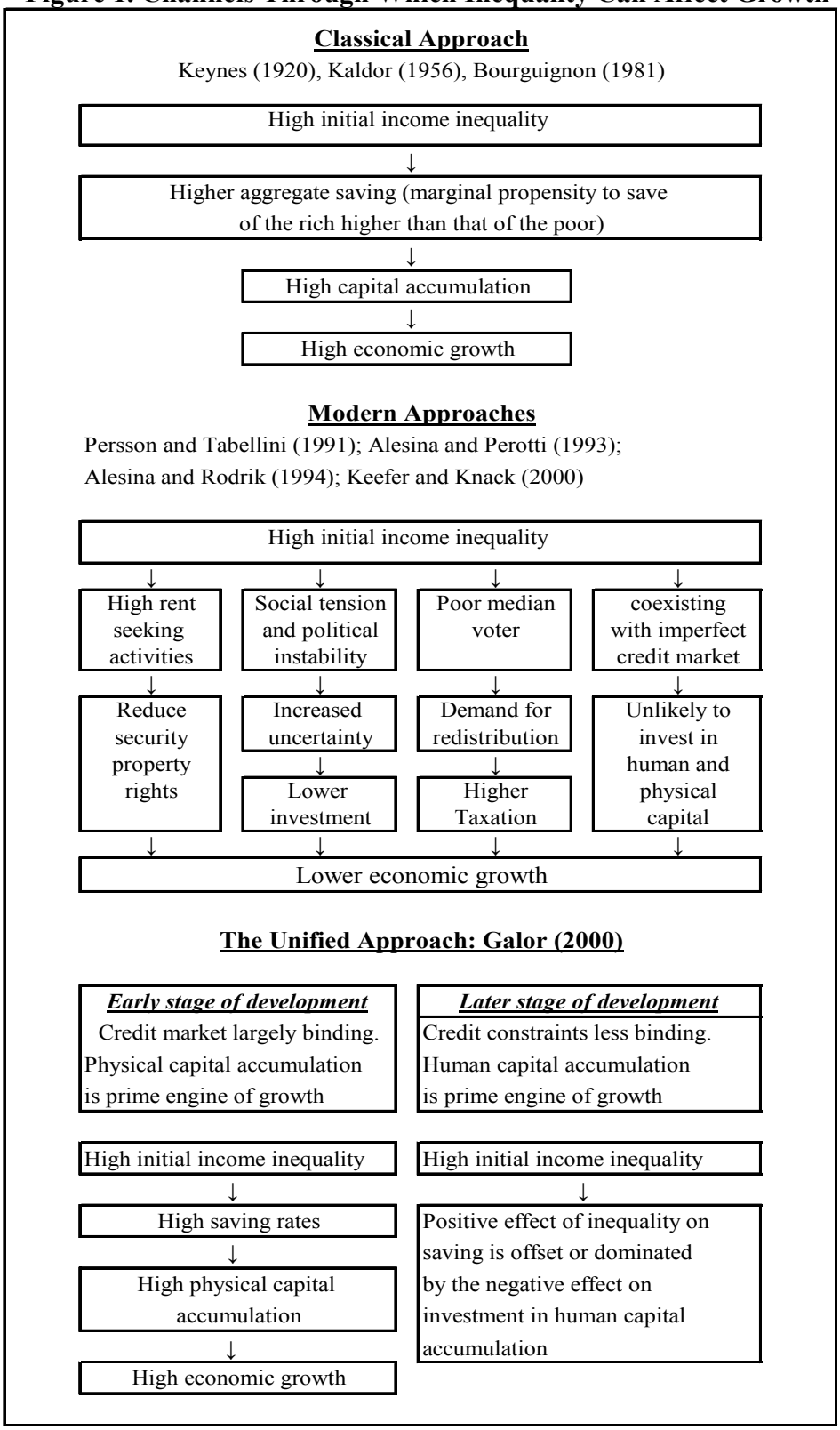
Is income inequality harmful for growth? What are the factors which explain the differences in inequality across countries? Do higher government expenditures reduce inequality? To answer these questions, this section examines the related theory and the available cross-country evidence.

A. Impact of Inequality on Growth

There is as yet no consensus throughout the economics profession on the relationship between income inequality and growth. Early thinking on the effects of inequality on growth suggested that greater inequality might be good for growth, for example by redistributing income to the rich, who save, from the poor, who do not. This view implied a trade-off where more growth could be bought for the price of more inequality, with ambiguous effects on poor people. Figure 1 presents three different approaches of the channels through which income inequality affects growth:

- The classical approach (Kaldor, 1957 and Bourguignon, 1981) suggests that the marginal propensity to save of the rich is higher than that of the poor, implying that a higher degree of initial inequality will yield higher aggregate savings, capital accumulation, and growth.

Figure 1. Channels Through Which Inequality Can Affect Growth



- In contrast, the modern approaches emphasize the main four channels through which income inequality lowers growth: (a) the impact of inequality on encouraging rent-seeking activities that reduce the security of property rights; (b) unequal societies are more prone to difficulties in collective action—possibly reflected in political instability, a propensity for populist redistributive policies, or greater volatility in policies—all of which can lower growth; (c) the median voter in a more unequal society is relatively poorer and favors a higher (and thus more inefficient) tax burden; and (d) to the extent that inequality in income or assets coexists with imperfect credit markets, poorer people may be unable to invest in their human and physical capital, with adverse consequences for long-run growth.

- Galor's (2000) "unified model" provides an intertemporal reconciliation for the above two conflicting approaches (Box 1). He argues that the classical approach holds at low income levels but not at later stages of development. In the early stage of development, inequality would promote growth because physical capital is scarce at this stage and its accumulation requires saving. Inequality in income would then result in higher savings and rapid growth. In later stages of economic development, however, as the return to human capital increases owing to capital-skill complementarity, human capital becomes the main engine of growth. Credit constraints, however, become less binding as wages increase, and the adverse effect of income inequality on human capital accumulation subsides, and thus the effect of inequality on the growth process becomes insignificant.

Box 1. The Unified Model

The unified approach complements the research of Galor and Weil (1999, 2000) who developed unified models that encompasses the transition between three distinct regimes that have characterized the process of economic development: the Malthusian Regime, the Post-Malthusian Regime, and the Modern Growth Regime, focusing on the historical evolution of the relationship between population growth, technological change, and economic growth.

Galor and Moav (1999) argue that inequality has a positive effect on capital accumulation but negative effect on human capital accumulation in the presence of credit constraints. In the early stages of development physical capital is scarce, the rate of return to human capital is lower than the return on physical capital and the process of further development is driven mainly by capital accumulation.

In the early stages of development, the positive effect of inequality on aggregate saving more than offsets the negative effect on investment in human capital and, since the marginal propensity to save is an increasing function of the individual's wealth, inequality increases aggregate savings and capital accumulation, enhancing the process of development. In the later stages of development, however, the positive effect of inequality on saving is offset by the negative effect on investment in human capital.

There is empirical evidence that growth depends on human capital, economic policies—such as openness to international trade, sound monetary and fiscal policies (reflected in small budget deficits and the absence of high inflation)—and a well-developed financial system. Other factors, such as geography, initial incomes and level of corruption, matter as well. Strong evidence suggests that growth is higher in countries with lower initial per capita income and in countries that have experienced a sharp fall in output (such as the transition economies in the early 1990s).[3]

In the past few years, inequality has been added as an additional independent variable to such cross-country growth regressions. But the literature has found mixed results using different samples and different econometric techniques. On the one hand, Alesina and Rodrik (1994), Clarke (1995), Perotti (1996), and Panizza (2002) found support for a negative impact of inequality on growth using cross-country growth regressions. Meantime, Deininger and Squire (1998) questioned the robustness and the validity of the negative association between inequality and growth.

On the other hand, Forbes (2000) found positive effects of income inequality on growth. She argued that country-specific effects and omitted variables are the cause of a significant negative bias in the estimations of the effects of inequality on growth. She also concluded that fixed-effect estimations yield the consistent result of a positive short- and medium-term correlation between inequality and growth. Smith (2001), examined empirically two hypotheses—subsistence consumption and credit market imperfections—of specific channels for inequality to affect private saving rates. He found that there is econometric evidence that especially at low per capita income levels, income inequality may be associated with higher aggregate savings.

B. Kuznets's Law

Kuznets (1955) argued that the income distribution within a country was likely to vary over time with its progress from a poor agricultural society to a rich industrial society. The average per capita income of the rural population is usually lower than that of the urban population, whereas income distribution within the urban population is more unequal. In the urban population, savings are concentrated in the upper-income groups and the cumulative effects of such savings would be the concentration of an increasing proportion of income yielding assets in the upper-income groups. Thus, as the weight of the urban sector in the economy increases with industrialization, the country's overall income distribution will tend to deteriorate until such time as the urban sector dominates. Thereafter, the income distribution will tend to stabilize because of three factors: (i) the slower growth in the population of the wealthier classes; (ii) the exploitation of the opportunities for wealth-

[3] Examples of this line of work include Fischer (1993), and Iradian (2003). Fischer, for example, shows that growth is negatively associated with inflation, large budget deficits, and distorted foreign exchange markets. Iradian demonstrates that higher levels of financial intermediation (as measured by broad money and private credit to GDP) are associated with higher growth prospects, and that growth is usually higher in countries following a sharp fall in output (such as the transition economies in the early 1990s)

creation offered by technology undertaken by those whose assets are not in established industries; and (iii) the shift of workers away from lower-income to higher-income industries.

The literature in the 1960 and 1970s in general supported the hypothesis that income inequality is related to the level of per capita income (see especially Ahluwalia 1976). According to Kuznets' law, the relationship between income inequality and per capita income may be described by a curve in the shape of an inverted U, with an upward phase in which income inequality increases with rising per capita income, and a downward phase in which inequality declines with increases in per capita income. Some of the recent literature, however, challenged this hypothesis and several empirical studies found no significant relationship between inequality and per capita income, see Anand and Kanbur (1992). Li, Squire, and Zou (1998) argue that the Kuznets curve works better for a cross section of countries at a point in time than for the evolution of inequality over the time within countries.

During the past three decades, diverse patterns have emerged with respect to income distribution. On balance, Table 1 shows that more countries have experienced some worsening in inequality (see Appendix II for the full data set). Most South and East Asian economies grew at high per capita rates since the early 1970s while maintaining moderate levels of inequality, although increasing over time, in particular in China. In contrast, Latin American countries grew by less than half of the average growth rate in South and East Asia while maintaining high inequality. The differences in inequality at a given rate of growth could reflect a different combination of policies and institutions across countries and that these differences in policies matter for income distribution.[4]

C. Growth, Inequality, Government Spending, and Poverty

The positive relationship between economic growth and poverty reduction is clear. However, there are significant differences across countries and over time in how much poverty reduction occurs at a given rate of economic growth. The extent of poverty reduction depends on how the distribution of income changes with growth and on initial inequalities in income and the sources or quality of growth. In theory at least, if income inequality increases, it is possible for a country to enjoy positive economic growth without significant benefit to its poorest segment of population—the rich get richer while the incomes of the poor stagnate. Therefore, establishing the relationship between economic growth and income distribution is critical for poverty reduction.

[4] De Ferranti and others, 2004, p. 133.

Table 1. Inequality and Growth in Selected Countries

	Household surveys based on 1/	Inequality (as Measured by Gini Index)				Per Capita Annual Real GDP Growth (in %)		
		1970	1980	1990	2000	1970–79	1980–89	1990–2000
Argentina	I	….	43	45	52	0.8	-2.8	3.0
Brazil	I	58	58	63	59	6.2	0.9	1.5
Chile	I	51	53	56	57	0.9	1.0	5.2
Colombia	I	52	48	51	58	3.9	-0.7	1.1
Dominican Rep.	I	….	45	51	50	….	0.8	1.0
Mexico	I	58	51	55	55	4.1	0.4	2.0
Venezuela	I	49	48	44	48	3.0	-3.0	0.1
Subtotal		53	49	52	54	3.2	-0.5	2.0
Bangladesh	E	26	27	28	32	1.8	2.3	3.8
China	E	….	32	35	45	4.6	8.7	8.9
India	E	30	32	31	33	1.6	3.6	4.1
Korea, Rep. of	I	35	39	34	32	6.9	6.0	5.4
Malaysia	I	51	49	46	44	4.9	3.4	4.6
Thailand	E	42	43	43	43	5.6	6.3	3.2
Subtotal		31	32	31	33	3.6	4.3	4.3
Egypt	E	….	32	34	34	4.4	3.1	2.2
Mauritania	E	….	….	40	39	….	-0.4	2.1
Morocco	E	….	39	39	40	3.2	2.7	1.2
Pakistan	E	32	32	31	33	1.7	3.1	1.4
Tunisia	E	48	46	40	40	5.4	1.8	3.0
Uganda	E	….	….	38	41	….	-0.2	4.3
Zambia	E	….	….	48	53	….	-2.1	-2.3
Subtotal				39	40		1.1	1.7
Canada	I	32	31	31	33	2.9	1.9	1.5
Finland	I	32	31	26	27	2.8	3.2	1.6
Germany	I	39	37	36	38	2.8	1.2	2.7
Sweden	I	21	19	22	25	1.6	1.8	1.3
United States	I	39	40	43	41	2.5	1.8	1.9
Subtotal		33	32	32	33	2.5	2.0	1.8
Total average		46	43	45	47	3.9	2.2	3.2

Sources: Derived from World Bank, OECD, and IMF reports and databases.
1/ I denotes household surveys based on per capita income, and E, household surveys based on consumption.

Fiscal policy is important both for reducing poverty and for improving social indicators through government expenditures programs. But increasing total government expenditures is

not always the answer to improving the well-being of the poor. The composition of expenditures greatly influences the nature and outcome of government spending. Several developing countries were able to maintain social spending or even increase it as a share of GDP while total government expenditures were reduced. Chile, for example, managed to protect services to the poor during its fiscal adjustment in the 1980s and 1990s. Despite lower public spending on goods and services overall, basic health and child nutrition programs targeted to the poor expanded. This helped to sustain a continued improvement in social conditions in the 1980s and 1990s.[5]

Larger public spending on the social sectors (education, health, and housing) and on infrastructure is necessary to alleviate poverty and promote human development. The markets for education and health services are imperfect and governments in many countries have no other choice but to intervene on grounds of equity and efficiency. The link between social spending and income distribution is particularly strong, and public investment in human capital can be an efficient way to reduce income inequality over the long run. Investment in infrastructure could also be considered as poverty-reducing public expenditure. For example, building a road that eases access to a market for rural farmers enhances their income.

However, a larger government (as measured by the ratio of public expenditure to GDP) is also likely to harm growth prospects.[6] This is particularly the case if the government maintains ineffective public programs and a bloated bureaucracy. In a retrenchment of the public sector, programs that benefit the poor might be cut. Also, if public employment plays a safety net role, then retrenchment may lead to increasing income inequality.

III. DATA ISSUES

Data quality and measurement errors are major concerns in cross-country studies, particularly in the case of inequality and poverty data. In this paper, a concerted effort has been made to ensure that the statistics are comparable across countries and over time, using similar definitions of variables for each country and year. However, perfect comparability is not attainable, since the coverage of and questionnaires used in household surveys differ among countries and frequently also within countries over time. Whenever a trade-off arises, I decided to preserve comparability within a country over time rather than across countries.

While the quality of the World Bank data on poverty and inequality has recently improved, it is still far from being problem free. The data available at http://www.worldbank.org/research/povmonitor/ includes a data set on poverty and inequality for about 60 developing and transition countries. However, many of these countries had only one or two observations of three or more years apart. I have, therefore,

[5] Tanzi, Chu, and Gupta (1999), pp. 109–49.

[6] See Iradian (2003).

expanded the existing data set by including comparable data on poverty and inequality from recent household surveys included in IMF staff reports and in Poverty Reduction Strategy Papers (PRSPs). I have also added to the sample data on inequality for the Organization for Economic Development (OECD) countries. All regions are well represented in the whole sample (16 countries from Latin America, 12 from sub-Saharan Africa, 12 from South and East Asia, 11 from the former Soviet Union, 6 from Central and Eastern Europe, 8 from the Middle East and North Africa, and 17 OECD countries)

The data set refers to an unbalanced panel of 82 countries observed from 1965 to 2003 (unequal country sizes or data are not available for all countries in the same period). The use of panel data allows us to control for time-specific effects, as well as country-specific effects. Also, the likely endogeneity of some explanatory variables can be accounted for using previous observations of the variables in the panel as instruments. The constraining factor is the scarcity of inequality and poverty data over time for many countries. Those included in the regressions have at least three observations. In the data set, two household surveys for one country define what is called an interval. In constructing the intervals the following criteria were used: intervals must be three or more years in length. They come from nationally representative surveys, and use either expenditures or income per person over time.

Data on poverty and inequality may not be comparable across countries as a result of differences in definitions and methodologies. There are some problems in comparing household surveys across countries. Different countries have different definitions of poverty, and consistent comparisons between countries based on the same definition can be difficult to obtain. The most widely used poverty indicator for developing and transition economies is the one used by the World Bank: the percent of the population living below $1 a day of consumption or income at 1993 prices, adjusted for purchasing power parity (PPP).

National household surveys are often the source for constructing consumption or income distributions and estimating poverty. But their design is not standardized across countries and over time, leading to significantly different estimates of average consumption or personal income. Some surveys only obtain information on income of households and others only on consumption. For developing and transition countries, slightly more than half of the observations are based on expenditures, and the remaining on income. Also, the Gini coefficient for some OECD countries is based on individual rather than households incomes. Household surveys based on expenditure data are usually regarded as more accurate than income data because they are likely to have fewer errors of underreporting. Also, data on expenditures yield a lower estimate of inequality than that based on income data, as a result of the higher saving rates of upper-income classes, the size of the informal economy, and private transfers.[7] While there are significant methodological differences across surveys in

[7] In many transition and developing economies, the poor, who are often engaged in the shadow economy, particularly in trade, housing construction, maintenance, and some traditional service sectors, have higher income than is recorded formally in the household budget survey.

different countries, these differences are likely to be less important in surveys conducted in a particular country across time. Although there is no perfect solution for this problem, using only one type of survey for each country and restricting cross-country comparisons to changes (as opposed to levels) of poverty and inequality, should go a long way toward addressing these problems.

IV. ECONOMETRIC RESULTS

A. Growth and Inequality

This section presents the panel regression results on the relationship between inequality and growth. Previous studies utilized Ordinary Least Squares (OLS) to estimate the cross-country growth regression. The resulting estimates of a negative coefficient on inequality suggested that countries with a more equal income distribution (that is a lower Gini index) tend to have higher levels of income. Due to the limited availability of comparable inequality statistics, sample selection is always a problem in estimates of the relationship between inequality and growth. This problem is magnified by using inappropriate econometric techniques of panel data. This paper specifically addresses these problems by using the fixed effect and the Generalized Method-of-Moments (GMM) econometric estimation techniques for panel data (for a brief description of these techniques see Appendix I).

Credit market imperfections could be a reason why inequality may increase growth. Galdor and Zeira (1993) have argued that when individuals cannot borrow against future income, the initial income inequality level affects physical and human capital accumulation and growth. Their models suggest that the poor are likely to be most affected by credit market imperfections.

One way to econometrically evaluate this hypothesis is to include the inequality variable and measures of credit market imperfections in a standard growth equation. Following King and Levine (1993), two variables from *International Financial Statistics* (IFS) were used to proxy financial market development and credit market imperfections. The first is the share of broad money (M2) in GDP, and the second is the share of credit to the economy in GDP. The specification estimated in Table 2 is as follows:

$$GR_{it}=\alpha_{1t}+\beta_1 GINI_{it-1}+\beta_2 LogY_{it-1}+\beta_3 INV_{it}+\beta_4 INF_{it\ t}+\beta_5 GINI_{it-1}*HFI+\beta_6 HFI+\mu_i+\nu_t+\varepsilon_{it} \quad (1)$$

where GR is the average growth rate of per capita GDP at 1993 prices and PPP adjusted; $GINI_{it-1}$ is the Gini index in the previous period; $LogY_{it-1}$ is the natural logarithm at the beginning of the period of per capita GDP in dollars at 1993 prices and PPP adjusted; INV_{it} is the share of gross capital formation in GDP; INF_{it} is the average CPI inflation rate; HFI is a dummy variable equal to one for countries with a high level of financial intermediation, that is, above the sample median (as measured by the share of M2 and credit to the private sector in GDP); i =1, 2, …, n cross-sectional units (in this case, countries); μ_i is a country-specific unobservable effect, ν_t is a time-specific factor; and ε_{it} is the disturbance term.

Table 2 shows the panel regression estimates for the determinants of per capita real GDP growth. As to the impact of other explanatory variables (excluding inequality and financial intermediation level) on growth the main findings of the panel regressions are as follows:

- There is a negative and significant correlation between growth and initial income per capita expressed in U.S. dollars. A poor country, other things being equal, tends to grow faster than a rich country.

- There is a strong association between investment shares and GDP growth.

- Macroeconomic instability (as measured by inflation) is negatively correlated with growth. The links appear to operate through a dampening of both investment and productivity.

The positive relationship between inequality and growth challenges previous empirical results. The estimated coefficients on inequality ($GINI_{it-1}$) are positive in columns (1) to (4) (which test the short to medium-term effect of inequality on growth). Columns (3) and (4) in Table 2 split the full sample by low and high financial intermediation levels. The effect of inequality on growth differs between low and high financial intermediation sub-samples.

It is expected that $\beta_1>0$, $\beta_5<0$, and $\beta_6>$ meaning that the positive effect of inequality on growth is weaker in countries with high financial intermediation levels (or developed financial markets). The interaction term, $GINI_{it-1}$* HFI, is strongly negative in column (1). Despite the relatively low t-statistics, an F-test shows that $GINI_{it-1}$* HFI and the dummy variable HFI are jointly highly significant. Also the coefficient for HFI (β_6) is positive and highly significant as expected. The insignificance of the inequality coefficient in column (4) is consistent with the argument that inequality has no explanatory power in countries with developed financial markets.

The long-term relationship between inequality and growth, however, is different than the short to medium-term relationship as shown in columns (5) and (6). Here the data are constructed as 10–20 year averages, and the estimated inequality coefficients are negative and statistically significant at the 10 percent level of confidence.

In conclusion, credit market imperfections may be a source of the positive link between inequality and growth. The results show that inequality stimulates growth in the short- to medium-term in countries with low levels of financial market development and credit available to the private sector. Over the long-term, however, inequality may have an adverse impact on growth.

Table 2. Growth, Income Inequality, and Credit Market Imperfections

Estimation	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Full Sample 1/		Financial Intermediation 1/		Long-term Effect 2/	
			Low 3/	High 4/		
Inequality (Gini index)	0.07	0.04	0.07	0.02	-0.05	-0.04
	(3.2)	(1.9)	(2.7)	(0.4)	(1.9)	(1.8)
Log (per capita income)	-1.36	-0.86	-1.63	-0.71	0.98	-0.98
	(4.9)	(4.1)	(3.7)	(3.6)	(2.6)	(2.6)
Investment/GDP	0.19	0.21	0.21	0.23	0.17	0.17
	(6.5)	(7.0)	(5.8)	(7.5)	(5.3)	(5.3)
Inflation rate	-0.03	-0.03	-0.03	-0.05	-0.02	-0.01
	(5.8)	(7.2)	(5.0)	(2.5)	(1.3)	(0.8)
Inequality * HFI	-0.07				0.08	
	(1.9)				(1.6)	
HFI Dummy 5/	3.67				-2.44	
	(2.4)				(1.5)	
Countries	82	82	56	26	64	64
Number of observations	269	269	164	105	81	81

Source: Authors' own calculations.
Notes: Dependent variable: average annual per capita growth rate between two survey years of 3 to 6 years apart. See Appendix II for full set of data and definitions of variables. T-statistics in parenthesis are heteroskedasticity corrected.
1/ Short- to medium-term effect. Each observation is derived from household surveys of 3 to 7 years in length.
2/ Each observation is derived from household surveys of 10-15 years in length.
3/ Algeria, Argentina, Armenia, Azerbaijan, Bangladesh, Brazil, Bulgaria, Cameroon, China, Colombia, Costa Rica, Dominican Rep., Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Georgia, Ghana, Honduras, Hungary, India, Indonesia, Iran, Jamaica, Ivory Coast, Kazakhstan, Kyrgyz Rep., Latvia, Lesotho, Lithuania, Mali, Mauritania, Mexico, Morocco, Nepal, Nigeria, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russia, Senegal, Sri Lanka, Tajikistan, Turkey, Uganda, Venezuela, Vietnam, and Zambia.
4/ Austria, Belgium, Canada, Chile, China, Finland, France, Germany, Ireland, Italy, Japan, Jordan, South Korea, Malaysia, Netherlands, New Zealand, Norway, Panama, Portugal, Spain, Sweden, Thailand, Tunisia, the United Kingdom, Uruguay, and the United States.
5/ HFI is a dummy variable to indicate countries with relatively high financial intermediation level. The shares of credit to the private sector and broad money in GDP are used as proxies to determine the level of financial intermediation.

B. Determinants of Income Inequality

Subsequently, I consider the factors influencing the variation of income inequality between countries and over time. In this paper, an effort has been made to compile an improved set of inequality statistics not only to reduce measurement error, but also to utilize panel estimation to control for time-invariant omitted variables.

Figure 2 shows a scatter of the inequality values against values of the log of per capita real GDP. A Kuznets' curve would appear as an inverted-U relationship between the Gini value and log of GDP per capita (a proxy measure of economic development). The framework does not include country fixed effects, which would eliminate the cross-sectional information in the data. While the results should reflect both cross-sectional differences among countries as well as variations over time within countries, the main information comes from the cross-sectional dimension due to the fact that few observations are used for each country.

Figure 2. Inequality Versus Per Capita Income

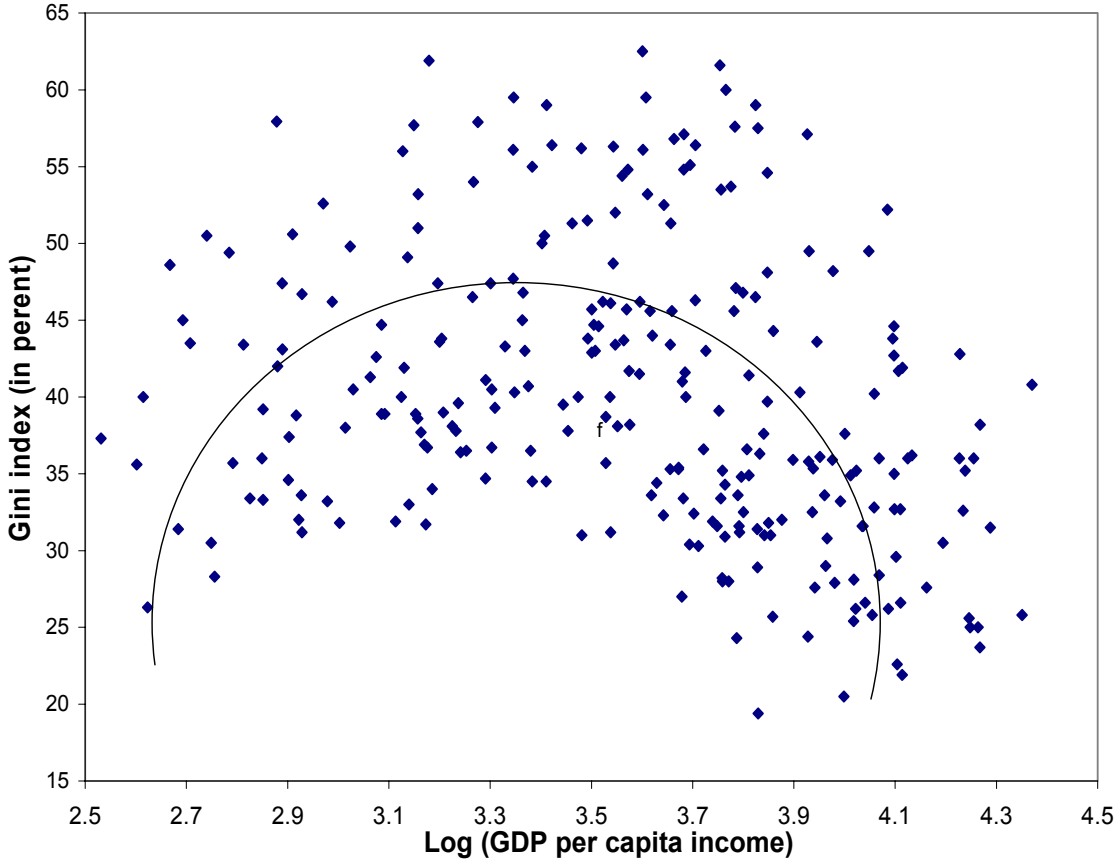


Table 3 shows the panel regression results of the following equation:

$$\text{Log GINI}_{it} = \beta_1 \text{LogY}_{it} + \beta_2 \text{Log}^2\text{Y}_{it} + \beta_3 \text{Log EXP}_{it} + \beta_4 \text{Log EDUC} + \beta_5 \text{POPGR} + \text{Regional Dummies} + \text{Dummy for Income based Inequality} + \mu_i + \nu_t + \varepsilon_{it}, \quad (2)$$

where Log GINI_{it} is the natural logarithm of the Gini index[8]; LogY_{it} is the natural logarithm of income per capita and $\text{Log}^2\text{Y}_{it}$ is included in equation (2) to test the hypothesis of a nonlinear conditional convergence; Log (EXP) is the natural logarithm of government expenditures in GDP (proxy for government expenditures on social sectors); EDUC is the secondary school enrolment rate (in percent of the total secondary school-aged population); POPGR is the percent change in population; i =1, 2, …, n cross-sectional units (here countries); μ_i is a country specific unobservable effect, ν_t is a time specific factor; and ε_{it} is the disturbance term. The following dummies are used:

D1: a dummy variable equal to one if the country is in Sub-Saharan Africa;
D2: a dummy variable equal to one if the country is in Latin America;
D3: a dummy variable equal to one if the country is in East Europe or the former Soviet Union for the period prior to 1995; and
D4: a dummy variable equal to one for the income-based measure of the Gini index.

The panel regression results presented in Table 3 show clear evidence of a non-monotonic relationship between inequality and the level of development as measured by per capita income. The estimated coefficients of LogY_{it} and $\text{Log}^2\text{Y}_{it}$ reported are highly significant and of the expected sign, implying a quadratic relationship between income per capita and inequality (Kuznets' curve). The estimated coefficient is about 1 on the linear term and -0.15 on the squared term. The estimated coefficients were also found to be stable over time. The Gini coefficient value rises with per capita GDP to a certain level (estimated at about 4,000 in PPP dollars of 1993 prices) and declines thereafter. However, per capita income explains only about 20 percent of the variations in inequality across countries or over time (first column of Table 3).

These results are consistent with the findings in section A on the relationship between inequality and growth. They may have important implications for policies relating to income distribution in poor developing countries. Thus, if during a given period income inequality shows a tendency to increase modestly, than according to Kuznets' law (which is confirmed in this paper) income inequality would have to be treated as an inevitable consequence of an increase of per capita incomes in the early stages of growth. It could then be argued that it is only in subsequent stages of their growth that there would be a "trickle down" of the effects of growth and a reduction of income inequalities.

---

[8] To address the problem of inconsistency resulting from the use of Gini coefficients based on expenditure and income, I included a dummy variable with a value of 1 for inequality observations that are based on income.

There are other factors that also explain differences in inequality across countries. These may include the following: (i) school enrollment ratio; (ii) share of agriculture in GDP; (iii) real growth rate in agriculture; (iv) population growth; (v) governance; and (vi) other social and structural factors particular to countries or regions. However, historical data on governance and growth in agriculture is not available for most developing countries. Columns two and three of Table 3 include secondary school enrollment ratio, government spending as percent of GDP, and population growth in addition to per capita income.

Table 3. Determinants of Inequality

Independent Variable	Dependent Variable: Log (Gini Index)		
Log (per capita GDP)	1.12	1.25	0.98
	(5.4)	(7.1)	(6.3)
Log (per capita GDP) squared	-0.16	-0.19	-0.15
	(6.1)	(7.3)	(6.7)
Log (government expenditure as % of GDP)		-0.15	-0.17
		(3.8)	(4.13)
Population growth		0.02	0.02
		(2.5)	(2.4)
Log (secondary school enrollment)		-0.18	-0.15
		(4.6)	(3.7)
Dummy for sub-Saharan Africa 1/			0.08
			(4.9)
Dummy for Latin America 2/			0.14
			(12.1)
Dummy for transition economies 3/			-0.07
			(6.6)
Dummy for income based inequality 4/			0.04
			(3.2)
Adjusted R-squared	0.19	0.31	0.61
Number of countries	90	90	90
Number of observations	378	378	378

Source: Authors' own calculations.

Notes: T-statistics in parenthesis. Estimation is by fixed effects.

1/ The first dummy variable equals one if the country is in sub-Saharan Africa and zero otherwise.

2/ The second dummy variable equals one if the country is in Latin America and zero otherwise.

3/ The third dummy variable equals one for transition economies or socialist countries prior to 1994, that is, before significant progress was made to move to a market economy.

4/ The fourth dummy equals one if the Gini index is based on income rather than consumption.

Governments may be inefficient (more government means less growth) but appear to be benevolent since more government spending may reduce inequality. The estimated coefficient for the government size or government expenditures in terms of GDP has the right sign and is highly significant. Higher targeted government spending can be expected to improve the income distribution to the extent that rent seeking by privileged groups is avoided and government bureaucracies concentrate on enhancing the possibilities of the poor. While cutting the size of the government is likely to lead to faster growth,[9] it could increase inequality.

The coefficient on the secondary school enrollment ratio (a proxy for human capital) was found to be negative and highly significant. This implies that improvement in education could reduce inequality. In contrast, high population growth would increase inequality.

Subsequently, I re-estimated the model using regional dummies. The estimated coefficients of the dummy variables for Latin America[10] and sub-Saharan Africa are each positive and statistically highly significant. The results show that Latin America and the sub-Saharan region are 14 and 8 points, respectively, more unequal than the average for all countries. The dummy variable for transition countries is also significant but of negative sign as expected. The dummy variable for inequality based on income (D4) is also highly significant with a negative sign as expected. The estimated coefficient for D4 implies that inequality based on income is on average about four percentage points higher than inequality based on expenditures for the whole sample.

C. Role of Growth, Equity, and Government Expenditures in Reducing Poverty

Poverty is a multidimensional phenomenon, encompassing both monetary and non-monetary aspects. A common component of all poverty measurement and analysis is the setting of a poverty threshold, or a poverty line. People with welfare levels below the line are defined to be poor, and those above are not poor. Despite the limitations of such an approach, poverty measures of these sorts are useful in that they: (i) serve a monitoring role on the evolution of living standards, and (ii) can be an important means of focusing policy attention and public debates on the deprived groups.

The choice of the definition of poverty depends on the purpose of the analysis or the policy objective. There is no universally accepted concept of poverty that can be applied to every conceivable situation in every country. The one dollar-per-day poverty line, which is adopted

[9] Iradian (2003).

[10] Latin America's inequality has deep historical roots and pervades contemporary institutions (De Ferranti and others, 2004).

in this paper, is the most widely used benchmark for developing and transition economies with a low per capita income.[11]

Rapid and sustainable economic growth is generally viewed as the primary vehicle for poverty reduction. The basic proposition is that if the economies of low-income countries grow rapidly enough and their income distributions are not unusually skewed against the poor, poverty reduction should occur. The experience of several countries has shown that poverty can increase not only because of a fall in output, but also because of increased inequality in the distribution of income. One important reason why inequality hinders poverty reduction is that the higher the level of inequality, the smaller are the absolute gains of the poor as the economy grows.

There is a significant difference across countries and over time in how much poverty reduction occurs at a given rate of economic growth. A key magnitude in assessing the impact of growth on poverty is the elasticity of poverty with respect to per capita real GDP growth. The correlation between per capita income and poverty incidence suggests some general tendencies related to income and poverty levels. First, lower poverty levels are associated with higher per capita income. Second, the incidence of poverty varies widely among countries with similar annual per capita incomes. The variation in poverty among countries with similar economic growth rates reflects the degree of income inequality of the countries. Also, as discussed earlier, in a retrenchment of the public sector, programs that benefit the poor might be cut. Larger government spending on social sectors (education, health, housing) and on infrastructure is necessary to alleviate poverty and to promote human development.

To capture the impact of growth, change in inequality, and government expenditure on poverty, the following equation is estimated:

$$\Delta P_{it} = \alpha_i + \beta_1 GR_{it} + \beta_2 \Delta GINI_{it} + \beta_3 \Delta EXP_{it} + \beta_4 GINI_{it-1} + \mu_i + \nu_t + \varepsilon_{it} \qquad (3)$$

where $\Delta P_{it\ is}$ the headcount change in poverty of the total population (in percentage points) for country i between two household survey years; GR_{it} is the per capita real GDP growth rate for country i between two survey years; $\Delta GINI_{it}$ is the change in inequality (in percentage points) between two survey years; ΔEXP_{it} is the change in government expenditures as percent of GDP for country i between two household survey years (a proxy

[11] Poverty lines are cut-off points separating the poor from the non-poor. They can be monetary (e.g., a certain level of consumption) or non-monetary (e.g., a certain level of literacy). The use of multiple lines can help in distinguishing different levels of poverty. There are two main ways of setting poverty lines—in a relative or absolute way: (i) relative poverty lines are defined in relation to the overall distribution of income or consumption in a country; for example, the poverty line could be set at 50 percent of the country's mean income or consumption; and (ii) absolute poverty lines are anchored in some absolute standard of what households should require in order to meet their basic needs. For monetary measures, these absolute poverty lines are often based on estimates of the cost of basic food needs (i.e., the cost of nutritional basket considered minimal for the healthy survival of a typical family), to which a provision is added for non-food needs.

for government expenditure on social sectors and infrastructure in the absence of such data for many developing and transition economies); and $GINI_{it-1}$ is the initial inequality level. Ideally, social spending should be used instead of total government expenditures. However, reliable and comparable breakdowns of government spending in many developing countries are not readily available. For this reason, equation (3) uses the change in total government expenditures as percent of GDP as a proxy for the change in social spending

The results of the panel regressions are reported in Table 4. The regression coefficients of growth in per capita GDP and change in inequality are statistically significant with the right signs. The estimated β_1 coefficient shows how much poverty could be reduced in percentage points for a given growth in real GDP per capita. The coefficient for the change in the Gini index or income distribution (β_2) is positive as expected and is also highly significant (robust). This finding suggests a positive and significant association between changes in inequality and the change in the level of poverty within a country. Growth will reduce poverty more if it is accompanied by a decrease in inequality, while poverty reduction will be tempered if growth is accompanied by an increase in inequality.

The regression results in Table 4 also show that the estimated coefficient for government expenditures (β_3) is highly significant (robust) and has the expected negative sign. Controlling for the per capita GDP growth and income distribution level, an increase in government expenditures (particularly on social sectors and infrastructure) can be expected to reduce poverty. One percentage point reduction in government expenditures to GDP ratio would increase poverty by 0.7 percentage points.

Table 4. Poverty, Growth, Inequality, and Government Size 1/

	Sample				
	Whole Sample			Low Income Cuntries1/	
Per capita real GDP growth	-0.30	-0.29	-0.30	-0.32	-0.28
	(11.4)	(10.5)	(11.2)	(8.5)	(8.2)
Change in Inequality	0.57		0.30	0.83	0.45
	(6.7)		(2.9)	(5.7)	(3.2)
Change in government expenditure		-1.01	-0.77		-1.01
		(8.3)	(5.7)		(5.7)
Initial level of Inequality		0.05	0.04		
		(3.2)	(3.3)		
Adjusted R-squared	0.58	0.62	0.68	0.61	0.71
Number of countries	72	72	72	51	51
Number of observations	196	196	196	142	142

Sources: Authors' own calculations.
Notes: t-statistics in parenthesis. All estimated coefficients are significant at the 1% level.
1/ Dependent variable is the poverty change in percentage points between two survey years.
2/ Developing and transition countries with per capita income of less than $3,000 calculated at PPP.

It is likely that poverty increases if the adverse impact of an increase in inequality more than offsets the reduction in poverty associated with growth. The regression results show that the extent of poverty reduction also depends on the initial inequality level and not only on the change in inequality. That is, for the same growth in per capita income, poverty will be reduced more in countries with low initial equality than in countries with high initial inequality. Other things being equal, growth leads to less poverty reduction in unequal societies than in egalitarian ones.

Higher growth is associated with a lower poverty rate, but the response of poverty reduction to growth varies among regions. The estimated β_1 coefficients by region could be used to calculate the elasticity for different regions, by dividing by their respective mean values of poverty rates. Such elasticity estimates generally measure the percentage change in the share of the population living below the poverty line following an increase of 1 percent in the average income or private consumption per capita of the population as a whole.

Table 5. Estimated Growth and Inequality Elasticities of Poverty, by Region

	Growth Elasticity of Poverty	Inequality Elasticity of Poverty	Mean Values				
			Poverty (% of pop.)	Inequality (Gini index)	Gov't Spending (% of GDP)	Investment (% of GDP)	Human capital 1/
Whole sample 2/	-1.08	1.40	28	42	23	22	50
Latin America 3/	-1.31	2.02	16	52	22	20	52
Sub-Saharan Africa 4/	-0.79	1.20	49	44	22	19	28
Middle East and North Africa 5/	-1.15	1.44	17	40	27	23	47
East and South Asia 6/	-0.79	1.35	30	38	19	26	53
Transition countries 7/	-1.41	1.30	31	31	30	19	71

Source: Author's own calculations.

1/ As measured by the secondary school enrollement rate.
2/ The World Bank studies (including Ravallion, 1997) show much higher growth elasticity of poverty (-1.68) and inequality elasticity of poverty (1.90).
3/ Brazil, Chile, Colombia, Costa Rica, Dominican Rep., Ecuador, El Salvador, Honduras, Jamaica, Mexico, Panama, Paraguay, Peru, Uruguay, and Venezuela.
4/ Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Lesotho, Madagascar, Mali, Mauritania, Nigeria, Senegal, Uganda, Zambia.
5/ Algeria, Egypt, Pakistan, Iran, Jordan, Morocco, Tunisia, and Turkey. This group of countries have relatively low incidence of poverty (except for Pakistan) and income inequality as compared with other countries of similar per capita income due to the substantial remittances and the large size of the public sector in the economy. International migration to the Persian Gulf and Europe and the large public sector employment has helped boost the income of the poor in several Middle Eastern and North African countries (Adams and Page, 2003).
6/ Bangladesh, China, India, Indonesia, Republic of Korea, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam.
7/ Armenia, Azerbaijan, Bulgaria, Georgia, Hungary, Kazakistan, Kyrgyz Republic, Romania, Tajikistan, Russia, and Ukraine.

The calculated elasticity varies substantially, depending on the particular sample of countries chosen (Table 5). Transition countries, as a region, have the highest poverty elasticity of growth. A 10 percent decline in real per capita growth would lead to a 14 percent increase in poverty incidence. Such a sharp increase in the poverty rate in response to economic

contraction suggests that the collapse of the centrally planned economic system in the early 1990s has affected the welfare of the population, not only through economic decline, but also through the deterioration of social conditions because of reductions in social expenditures by governments. For sub-Saharan Africa, the estimated elasticity of poverty reduction with respect to economic growth is -0.79 and the calculated inequality elasticity of poverty is 1.20. In general, if growth has a weak effect on poverty, it could be due to high inequality or a worsening income distribution, and thus poverty reduction policies should also focus on measures that could reduce inequality.

V. THE MILLENNIUM DEVELOPMENT GOALS OF POVERTY REDUCTION

The results in the previous section contribute to our knowledge of the relative importance of growth and equity in reducing poverty. The estimated growth and inequality elasticities of poverty could be used to determine the minimum economic growth required to achieve the Millennium Development goal of poverty reduction. The United Nations Millennium Declaration (General Assembly Resolution 55/2 of September 2000) endorsed the commitment to halve the proportion of people living in extreme poverty between 1990 and 2015. The poverty line in this case is based on one dollar per day in purchasing power parity.

Table 6 shows that poverty has declined significantly on a global level over the past two decades. However, most of this improvement was due to the sharp reduction in poverty in China and India, where the largest share of the world's poor people live. The poverty rate in east Asia and the Pacific in 20 years dropped from about 58 percent of the population in 1981 to 15 percent in 2001, mainly because of the dramatic poverty reduction in China. In contrast, poverty rates in sub-Saharan Africa have increased, in the same period moving from 42 percent of the population in 1981 to 47 percent in 2001. The explanation for this is mainly the stagnant annual per capita growth in sub-Saharan Africa over the past two decades. The decline in poverty in recent years in several Asian economies was due to both improved income distribution and sustained rapid growth.

A variation between countries has arisen to the extent to which poverty responds to growth. Initial inequality and per capita income are important factors. In this paper, the estimated growth elasticity of poverty is -1.08 and the inequality elasticity of poverty is 1.40 for the whole sample. The World Bank studies (including Ravallion, 1997) show much higher growth elasticity of poverty (-1.68) and inequality elasticity of poverty (1.90).

Based on the estimated growth elasticity of poverty in this paper, the per capita real GDP in sub-Saharan African countries needs to grow by at least 4.5 percent a year to reduce poverty from 47 percent in 2001 to 22 percent by 2015 (Table 7). Given an average population growth of at least 2 percent, this implies that the minimum needed economic growth should be about 6.5 percent a year. If we assume that inequality, as measured by the Gini index, improves by half a percentage point every year (that is average inequality in sub-Saharan Africa declines gradually from about 0.48 in 2001 to 0.40 in 2015) then real GDP needs to grow by 5.5 percent a year.

Table 6. Poverty and Growth Across the Globe

Regions/Countries	Percentage of Population Living on Less Than $1.08/day at 1993 PPP				Per Capita Growth	
	1981	1990	2001	Millennium 2015 goal	1981–90	1991–2001
East Asia and Pacific 1/	57.7	29.6	14.9	14.8	5.7	5.9
China	63.8	33.0	16.6	16.5	8.1	8.6
South Asia 2/	51.5	41.3	31.1	20.7	3.4	3.6
India	54.4	42.1	34.7	21.1	3.3	4.3
Sub-Saharan Africa 3/	41.6	44.6	46.9	22.3	-0.6	0
Latin America 4/	15.7	16.3	13.5	8.2	-0.1	1.7
Middle East & North Africa 5/	14.2	13.9	10.2	7.0	0.3	1.5
Total	40.3	27.9	21.3	14.0	2.4	4.1
Total (excluding China)	31.6	26.1	22.8	13.1	1.4	2.9

Source: Poverty figures extracted from http://www.worldbank.org/research/povmonitor/ on August 4, 2004, except for the Middle East and North Africa, which is derived from the data reported in Appendix II. Per capita annual growth figures are derived from the IMF WEO database.
Note: PPP denotes purchasing power parity.
1/ China, Indonesia, the Republic of Korea, Malaysia, the Philippines, Thailand, and Vietnam.
2/ Bangladesh, India, Nepal, Pakistan, and Sri Lanka.
3/ Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Ethiopia, the Gambia, Ghana, Lesotho, Madagascar, Malawi, Mali, Mauritania, Niger, Nigeria, Senegal, Tanzania, Uganda, Zambia, and Zimbabwe.
4/ Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.
5/ Algeria, Egypt, Iran, Jordan, Morocco, Tunisia, and Turkey.

Table 7. Projection of Poverty in Sub-Saharan Africa
(In percent of the population)

	Per Capita Annual Growth Rates (Inequality remains fixed = 0.47)				Per Capita Annual Growth Rates (Inequality declines to 0.40 by 2015)				Gini Index
	2%	3%	4%	5%	2%	3%	4%	5%	
2002	46.1	45.7	45.3	45.0	45.7	45.3	44.9	44.5	0.463
2005	43.8	42.2	40.7	39.1	42.1	40.6	39.0	37.4	0.448
2010	39.9	36.4	32.9	29.4	36.1	32.6	29.1	25.6	0.423
2015	36.0	30.5	25.1	19.6	30.2	24.7	19.3	13.8	0.398

Source: Authors' own calculations using estimated growth and inequality elasticities of poverty.

VI. Conclusion

The empirical results in this paper challenge the current belief that income inequality has a negative effect on economic growth. The panel regression results suggest that in the short-to-medium term, an increase in a country's level of income inequality may have a positive relationship with subsequent economic growth. Credit market imperfections may be a source of the positive link between inequality and growth. In the long term, however, inequality would have an adverse impact on growth.

The results in this paper also confirm the validity of the Kuznets curve, according to which income inequality first increases and later decreases during the process of economic development. Inequality rises with per capita income to a certain level, estimated at about 4,000 in PPP dollars and 1993 prices, and declines thereafter. However, per capita income explains only about 20 percent of the variations in inequality across countries or over time.

Higher growth in per capita income is associated with higher rates of poverty reduction. The variation in poverty with similar economic growth rates reflects the degree of income inequality of countries. Poverty would increase if the adverse impact of an increase in inequality more than offsets the reduction in poverty associated with growth. For the same growth in per capita income, poverty will be reduced more in countries with low initial equality than in countries with high initial inequality. Other things being equal, growth leads to less poverty reduction in unequal societies than in egalitarian ones.

Sub-Saharan African countries will need to grow by at least 6.5 percent a year to reduce poverty from 47 percent of the population in 2001 to 22 percent by 2015 (assuming that the level of inequality remains constant).

APPENDIXES

I. PANEL ESTIMATION TECHNIQUES

This section describes briefly three panel data estimation econometric techniques. The technique of Ordinary Least Squares (OLS) may be plagued by problems of reverse causality. Baltagi (2001) proposes several other econometric techniques to estimate panel data which could avoid the problem of reverse causality including Fixed Effects and the Generalized Method-of-Moments (GMM) dynamic panel estimators.[12] The optimal estimation technique is evaluated on the basis of the following two criteria: (i) the presence of unobserved time- and country-specific effects; and (ii) the likely endogeneity of some of the regressors. This chosen technique is necessary to control for unobserved time- and country-specific effects because these may be correlated with the right-hand side variables, and produce biased coefficients if omitted. The unobserved time-specific effects could be controlled for by using time-period dummies; this entails the elimination of information related to those variables that vary across time periods but not across countries.

The class of models that can be estimated using panel data can be written as:

$$y_{it} = \alpha_{it} + \beta_i X_{it} + u_{it} \quad (1)$$

$$u_{it} = \mu_i + \nu_t + \varepsilon_{i,t}, \quad (2)$$

where y_{it} is the dependent variable, and α_{it} and X_{it} are k-vectors on non-constant regressors and parameters for i =1, 2, …, n cross-sectional units (here countries); u_{it} is a general disturbance, including a country specific unobservable effect, μ_i, a time specific factor ν_t, and an idiosyncratic disturbance $\varepsilon_{i,t}$. The fixed effects μ_i act as proxy for other determinants of a country's steady state not included in X_{it} and the time specific factor ν_t controls for shocks common to all countries. Each country is observed for dated periods t =1, 2 … T.

Fixed-Effects Model

The fixed-effects estimator allows α_i to differ across countries by estimating different constants for each country.[13] The fixed effects model is equivalent to taking deviations from individual (country) means and then estimating an ordinary OLS regression using the transformed data:

$$(y_{it,} - \bar{y}_{i.}) = \beta (X_{it} - \bar{X}_{i.}) + (u_{it} - \bar{u}_{i.}), \quad (3)$$

[12] See Arellano and Bond (1991) and Arellano and Bover (1995).

[13] See Johnston and DiNardo (2000) pp. 397–99.

where $\bar{y}_i = \sum y_{it}/ n$; $\bar{X}_i = \sum x_{it}/ n$; $\bar{u}_i = \sum u_{i,t}/ n$.

The deviation from the mean purges the data of the fixed effects by removing means of these variables across countries. The OLS estimates of β in the fixed effects model are inconsistent, although as $T \to \infty$, the inconsistency disappears. But for finite, typically small T, the inconsistency remains, as is the case in this paper, with N=90 countries and T=7 (maximum periods for each country.

The coefficient covariance matrix estimates are given by the usual OLS covariance formula applied to the mean differenced model:

$$Var(b_{FE}) = \sigma^2_w (X'X)^{-1}, \quad (4)$$

where X represents the mean differenced x, and

$$\sigma^2_w = (e_{FE}'e_{FE})/(nT-n-k) = \{ \sum (y_{it} - x_{it}'b_{FE})^2\}/(nT-n-k), \quad (5)$$

where $u_{FE}'u_{FE}$ is the SRR from fixed effects model and (nT-n-k) is the correct number of degrees of freedom (nT being the number of observations, n the number of countries and k the number of parameters).

The fixed effects themselves are not estimated directly. They are computed from:

$$\alpha_i = \sum (\bar{y}_{i.} - \bar{X}_{i.}' b_{FE}) / N. \quad (6)$$

The fact that the fixed effects estimator can be interpreted as a simple OLS regression of means-differenced variables explains why this estimator is often called a within group estimator. That is, it uses only the variation within a country's set of observations.

Generalized Method-of-Moments (GMM)

Using the GMM estimator that was developed for dynamic models of panel data can be written as follows:

$$y_{i,t} - y_{i,t-1} = (\varepsilon-1)y_{i,t-1} + \beta x_{i,t} + \mu_i + \varepsilon_{i,t}, \quad (7)$$

where y is the natural logarithm of real per capita GDP, x is the set of explanatory variables (other than lagged per capita GDP), μ is an unobserved country-specific effect, ε is the error term.

Following the procedure of Anderson and Hsiao (1981) to account for unobserved country-specific effects, all variables in equation (7) are first-differenced. This eliminates not only the

unobserved country-specific effects but also all variables for which only cross-sectional information is available. After first-differencing and rearranging the terms of the dependent variable, equation (7) becomes:

$$y_{i,t} - y_{i,t-1} = \varepsilon (y_{i,t-1} - y_{i,t-2}) + \beta (x_{i,t} - x_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}). \quad (8)$$

First-differencing, however, introduces a correlation between the error term ($\varepsilon_{i,t} - \varepsilon_{i,t-1}$) and the differenced lagged-dependent variable ($y_{i,t-1} - y_{i,t-2}$). An OLS estimation in this case would produce biased results, even when the set of explanatory variables X is strictly exogenous. The other econometric problem to be addressed is the likely endogeneity of some of the regressors.

To deal with these two estimation problems, we need to use certain instruments. Under the assumption that in (8) the error terms $\varepsilon_{i,t}$ are serially uncorrelated (i.e., is $E(\varepsilon_{i,t} - \varepsilon_{i,s}) = 0$ for $t \neq s$, and the explanatory variables, X, are weakly exogenous that is $E(X_{i,t}\, \varepsilon_{i,s}) = 0$ for $s > t$, then values of y and x, respectively, which lagged two periods or more, are valid instruments in the equations in first differences. These two assumptions imply a set of moment restrictions that can be used in the context of the GMM to generate consistent and efficient estimates of the parameters of interest. This methodology follows work by Arellano and Bond (1991) on dynamic panel data estimation.

Consistency of the GMM estimator, however, depends on the validity of the instruments. To address this issue, I present two specification test suggested by Arellano and Bover (1995). The first is the Sargen test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term in the differenced regression ($\varepsilon_{i,t} - \varepsilon_{i,t-1}$) is not serially correlated. One potential limitation of the GMM approach is that not much heterogeneity is allowed across countries. Heterogeneity is restricted to the intercept but is not permitted in the slope coefficients. Yet, if the slope coefficients vary across units lagged, values of serially correlated regressors cannot be used as valid instruments

II. Data Definition, Sources, and Dataset

Data Definition and Sources

1. Per capita real GDP growth rates are annual averages between two survey years and are derived from the IMF WEO and the International Financial Statistics (IFS) data bases.

2. The inequality data (Gini coefficient) are derived from World Bank data, OECD, and the IMF staff reports and Poverty Reduction Strategy Papers (PRSPs).

3. The secondary school enrollment as % of age group is at the beginning of the period and derived from the World Bank data base.

4. Population growth rates are from the World Bank Development Reports.

5. Data on the ratio of government expenditure and investment as shares of GDP are averages for the period between two survey years and come from the IFS.

6. Inflation rates, annual averages between two survey years, are calculated using the IFS's CPI data.

7. GNP per capita at PPP are from the World Bank.

8. The poverty data is defined as the percentage of population living on less than $1 a day at 1993 prices and adjusted for purchasing power parity. The sources of the poverty data are the World Bank and recent IMF country reports and PRSPs.

9. Credit as % of GDP: Claims on the nonfinacial private sector/GDP, line 32d of the IFS.

10. M2 as % of GDP: Broad money/GDP, lines 34 plus 35 of the IFS.

Dataset

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Algeria	1988		38.7						4,060	40	70	13.9
Algeria	1995	-2.0	35.3	65	2.6	31.2	25	21	4,358	14	48	15.1
Algeria	1998	1.0	35.3	69	2.2	30.0	25	12	4,813	8	42	12.2
Argentina	1990		44.7						9,489	22	20	
Argentina	1996	5.0	48.2	73	1.4	15.4	19	4	11,172	20	17	
Argentina	1998	7.0	49.5	77	1.3	15.4	20	1	12,162	22	28	
Argentina	2001	-1.3	52.2	77	1.2	16.9	18	-1	11,544	19	28	
Armenia	1989		25.9			38.2			2,580	30	25	14.3
Armenia	1998	-6.0	37.9	86	-1.0	25.6	17	80	1,850	10	10	55.1
Armenia	2001	7.0	36.0	86	0.0	23.2	20	1	2,680	10	12	50.0
Armenia	2003	11.0	34.0	87	0.0	24.0	22	2	3,000	9	15	44.0
Australia	1980		39.3						10,016	28	40	
Australia	1985	2.8	37.6	56	1.4	38.9	26	9	12,790	30	39	
Australia	1990	2.6	41.7	55	1.3	33.9	25	9	17,314	51	48	
Australia	1994	0.5	35.2	51	1.2	35.7	21	2	20,407	67	58	
Austria	1970		29.3						6,200	45	41	
Austria	1976	4.5	31.2	64	0.0	42.0	27	9	6,722	55	50	
Austria	1981	3.6	31.4	62	0.0	50.3	23	6	10,829	70	63	
Austria	1987	1.7	31.6	60	0.2	52.0	20	4	15,648	80	72	
Austria	1995	2.0	30.5	58	0.4	52.5	22	3	21,702	94	85	
Azerbaijan	1989		32.8						2,310			33.6
Azerbaijan	1995	-9.0	45.0	49	1.0	17.0	24	170	1,790	13	12	68.1
Azerbaijan	2002	5.1	36.5	50	1.0	26.0	29	5	2,650	11	12	49.6
Bangladesh	1974		25.9						260	4	16	72.1
Bangladesh	1982	1.9	27.0	16	2.5	17.0	10	11	420	7	20	62.1
Bangladesh	1986	3.3	26.3	19	2.5	16.0	11	8	570	14	25	60.0
Bangladesh	1992	4.5	28.3	23	2.4	15.0	15	6	845	19	28	58.8
Bangladesh	1996	3.0	33.6	27	2.0	13.3	18	5	1,006	20	29	54.5
Bangladesh	2000	3.8	31.8	50	1.6	14.4	22	5	1,252	24	32	49.8
Belarus	1989		23.8						6,728			
Belarus	1995	-2.5	28.9	69	-0.2	42.4	26	220	4,939	12	28	
Belarus	2000	5.2	30.4	69	-0.2	45.9	26	110	7,712	11	22	
Belgium	1980		28.3						10,517			
Belgium	1985	3.6	26.2	98	0.1	40.9	19	4	12,908	27	75	
Belgium	1990	3.0	26.6	98	0.2	41.3	20	2	18,347	35	89	
Belgium	1996	1.8	25.0	97	0.3	40.6	20	2	22,251	32	86	
Brazil	1970		57.6						1,510	18	19	
Brazil	1975	8.0	61.9	40	2.3	22.0	25	200	2,219	26	18	
Brazil	1985	1.4	59.5	46	2.0	25.4	22	180	3,989	23	13	15.8
Brazil	1988	4.3	62.5	54	1.8	26.8	21	120	5,672	35	30	18.6
Brazil	1993	-2.0	61.6	60	1.6	29.8	19	150	5,831	45	44	18.8
Brazil	1996	3.3	60.0	62	1.4	29.0	20	60	6,671	40	35	14.9
Brazil	2001	1.4	59.0	66	1.2	30.0	20	6	7,571	30	31	

Dataset *(continued)*

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Bulgaria	1989		23.3						6,126			2.0
Bulgaria	1994	-4.2	24.3	66	-0.5	44.9	14	44	5,485	23	70	8.0
Bulgaria	2001	-0.3	31.9	68	-0.7	41.0	16	12	6,625	14	33	12.8
Cameroon	1984		49.0						2,215	28	24	40.0
Cameroon	1996	-2.8	47.7	24	3.0	15.5	15	13	1,843	14	20	53.3
Cameroon	2001	2.5	44.6	39	2.8	16.5	17	2	2,220	9	17	40.2
Canada	1965		31.6						4,388	22	37	
Canada	1970	3.0	32.3	80	1.4	34.4	23	5	5,601	24	38	
Canada	1975	3.0	31.6	84	1.3	36.8	22	9	7,148	34	42	
Canada	1980	2.6	31.0	87	1.2	40.0	24	10	11,434	40	45	
Canada	1985	1.2	32.8	90	1.1	47.0	22	9	14,529	48	46	
Canada	1990	2.6	30.6	92	1.1	46.8	22	5	19,407	49	50	
Canada	1998	0.3	33.1	93	1.0	44.0	20	2	23,643	60	60	
Chile	1975		46.0						1,439	12	22	
Chile	1980	1.4	53.2	49	1.7	28.0	15	150	2,643	32	26	
Chile	1987	1.0	56.4	58	1.6	25.0	17	21	3,999	51	36	10.2
Chile	1990	6.7	56.1	62	1.5	23.2	21	20	4,810	56	40	8.3
Chile	1994	6.5	54.8	66	1.4	21.0	24	13	6,743	49	38	4.2
Chile	1997	6.7	57.5	68	1.4	21.0	26	7	8,442	53	41	3.0
Chile	2000	1.7	57.1	70	1.3	23.0	23	5	9,097	60	40	1.0
China	1981		32.0						483	30	40	63.8
China	1985	9.0	31.4	54	1.4	20.5	29	13	797	35	55	41.0
China	1990	8.8	34.6	58	1.3	20.1	29	14	1,332	40	80	33.0
China	1994	9.0	40.0	60	1.1	14.5	30	10	2,230	45	101	27.0
China	1998	9.3	40.3	63	1.1	13.9	33	8	3,197	42	110	19.0
China	2001	6.3	44.7	67	1.1	14.9	36	1	4,059	50	138	16.6
Colombia	1988		53.1						4,538	15	12	4.6
Colombia	1991	2.0	51.3	52	2.1	13.0	18	28	4,818	14	15	3.0
Colombia	1996	2.4	57.1	54	2.0	15.3	20	23	6,074	16	20	11.0
Colombia	1999	1.3	57.6	56	1.9	19.1	19	14	5,727	20	25	
Costa Rica	1986		34.4						4,130	18	44	12.5
Costa Rica	1990	2.5	45.6	46	2.5	25.6	21	17	5,070	16	40	11.1
Costa Rica	1993	2.7	46.3	48	2.3	20.4	20	16	6,100	14	35	10.3
Costa Rica	1996	3.3	47.1	52	2.2	23.3	18	17	6,670	18	35	9.6
Costa Rica	2000	3.8	46.5	54	2.0	22.4	18	11	8,470	22	38	
Czech Republic	1989		19.4						10,980			0.4
Czech Republic	1993	-1.8	26.6	84	0.0	37.3	28	15	10,424	50	68	1.3
Czech Republic	1996	1.7	25.4	85	-0.2	42.2	30	9	12,818	56	74	0.0
Dominican Rep.	1980		45.0						2,136	15	22	
Dominican Rep.	1985	0.2	43.3	28	2.2	18.0	17	35	2,555	15	19	11.0
Dominican Rep.	1989	1.5	50.5	28	2.1	14.5	22	27	3,492	18	26	8.0
Dominican Rep.	1997	0.8	49.7	26	2.0	15.6	21	8	4,675	20	27	4.0
Ecuador	1992		52.3						3,732	20	22	24.5
Ecuador	1995	2.0	54.8	21	2.4	15.0	20	32	4,689	23	23	28.9
Ecuador	1998	0.5	56.2	23	2.3	15.5	18	28	3,313	28	22	

Dataset *(continued)*

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Egypt	1982		32.2						1,533	23	70	17.2
Egypt	1990	2.9	34.0	24	2.2	27.8	29	17	2,416	28	86	25.0
Egypt	1995	1.4	34.5	28	2.0	33.7	19	14	2,844	32	83	22.9
Egypt	2000	3.0	34.4	31	1.9	30.5	21	5	3,519	48	81	16.7
El Salvador	1989		49.0						2,897	5	5	25.5
El Salvador	1995	2.7	51.3	32	2.0	11.9	18	12	4,081	4	6	25.2
El Salvador	2000	1.8	53.2	33	2.0	12.3	17	3	4,581	5	6	22.0
Estonia	1989		29.9						8,678			1.9
Estonia	1995	-3.8	35.4	84	-1.0	40.5	22	35	6,922	15	27	8.9
Estonia	2000	6.1	37.6	86	-0.8	40.5	28	11	9,707	26	38	
Ethiopia	1981		32.0						412	6	27	48.0
Ethiopia	1995	-1.3	40.0	22	3.0	25.0	14	8	465	6	39	45.5
Ethiopia	2000	3.4	41.0	25	2.9	30.0	17	3	557	20	42	44.2
Finland	1970		31.8						4,774	42	34	
Finland	1975	5.4	27.0	85	0.4	31.2	29	15	5,808	45	37	
Finland	1980	2.0	30.9	87	0.4	36.6	27	13	9,240	46	38	
Finland	1985	3.0	30.8	90	0.4	41.4	27	7	12,207	55	45	
Finland	1990	3.8	26.2	92	0.4	44.4	26	6	17,610	77	63	
Finland	1995	-1.2	25.6	95	0.4	47.0	22	2	19,664	80	65	
Finland	2000	4.5	26.9	96	0.4	43.0	20	2	25,735	65	53	
France	1965		47.0						4,171			
France	1970	3.4	44.0	87	0.5	37.6	24	5	5,323	39	43	
France	1975	4.0	43.0	89	0.5	39.3	25	10	6,476	42	50	
France	1980	2.4	34.9	95	0.5	46.0	24	13	10,281	74	77	
France	1985	0.6	34.9	97	0.5	52.2	22	12	12,890	78	71	
France	1995	1.7	32.7	95	0.5	51.5	21	3	21,426	86	63	
Georgia	1989		29.2						4,844			13.0
Georgia	1995	-10.0	41.6	75	-0.5	21.1	13	310	1,422	4	7	60.0
Georgia	2002	5.1	38.9	71	-0.3	18.0	15	10	2,190	8	10	52.0
Germany	1970		39.2						5,269	65	51	
Germany	1975	2.6	36.6	53	0.3	44.0	22	7	6,410	69	51	
Germany	1980	3.0	36.6	60	0.2	48.3	21	4	10,549	76	55	
Germany	1985	-1.0	35.2	70	0.1	47.5	21	4	13,330	85	57	
Germany	1990	2.6	36.0	65	0.1	45.0	22	3	18,531	88	61	
Germany	1998	3.1	38.2	63	0.2	46.0	23	2	23,360	105	67	
Ghana	1987		35.4						1,236	3	14	47.7
Ghana	1992	2.0	38.9	47	3.0	20.0	14	18	1,456	4	16	50.0
Ghana	1998	1.8	36.0	44	2.9	21.3	22	32	1,780	6	17	39.5
Honduras	1990		57.6						2,216	24	31	55.0
Honduras	1995	1.0	56.1	34	3.0	16.0	25	17	2,417	22	29	48.3
Honduras	1999	-0.3	55.0	34	2.9	16.5	26	14	2,350	33	42	53.0
Hungary	1989		23.3						9,566			1.1
Hungary	1993	-4.5	27.9	78	-0.5	56.0	20	24	8,471	33	49	5.0
Hungary	1998	1.3	24.4	84	-0.4	49.0	21	18	10,070	24	46	3.0
India	1978		33.1						561	20	33	55.8
India	1984	1.5	30.5	30	2.1	13.6	20	8	848	24	39	49.8
India	1988	3.0	31.2	38	2.0	17.2	21	9	1,298	27	44	46.3
India	1994	3.7	31.9	45	1.9	16.4	22	10	1,709	24	45	42.3
India	1997	5.7	33.7	50	1.8	15.6	23	9	2,010	25	47	40.0
India	2000	4.0	32.5	54	1.7	16.0	22	6	2,370	25	48	34.7

Dataset *(continued)*

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Indonesia	1970		30.7						400			58.0
Indonisia	1980	5.6	35.6	20	2.0	19.5	21	31	836	9	17	29.0
Indonesia	1987	3.7	32.0	29	1.9	21.5	24	7	1,489	19	25	17.0
Indonesia	1993	5.8	31.7	40	1.8	17.7	27	9	2,400	45	43	14.8
Indonesia	1996	5.7	36.5	45	1.7	16.0	28	9	3,029	52	45	15.7
Indonesia	1999	-2.0	31.0	50	1.7	16.7	25	23	2,736	43	57	27.1
Iran	1986		47.0						3,523	25	42	27.3
Iran	1990	-6.8	43.4	42	3.0	21.1	23	21	3,219	24	50	26.0
Iran	1994	7.3	43.0	45	2.5	20.0	25	22	3,665	22	44	21.3
Iran	1998	2.3	43.0	46	1.8	22.5	28	25	3,691	20	40	20.9
Ireland	1970		43.7						3,376			
Ireland	1975	3.6	38.7	76	0.3	34.0	23	17	3,376	39	66	
Ireland	1980	2.6	35.7	78	0.4	38.3	25	19	5,740	46	63	
Ireland	1985	1.2	35.2	82	0.5	46.3	22	8	7,909	49	53	
Ireland	1996	4.1	35.9	87	0.4	41.0	19	3	18,554	70	71	
Italy	1975		39.0						5,806	73	80	
Italy	1980	3.0	34.3	63	0.1	41.9	24	14	9,813	59	85	
Italy	1985	1.8	33.2	65	0.1	50.8	23	12	12,547	51	70	
Italy	1990	2.8	32.7	65	0.2	53.0	22	6	17,990	49	65	
Italy	1998	1.5	36.0	64	0.2	47.4	20	3	22,415	52	60	
Ivory coast	1985		41.2						1,479	39	28	18.9
Ivory Coast	1989	-2.4	36.9	39	2.8	26.0	8	5	1,500	36	30	31.0
Ivory Coast	1995	3.0	36.7	37	2.6	25.3	11	8	1,600	28	28	36.8
Ivory Coast	1998	4.0	43.8	34	2.4	20.7	15	4	1,789	16	23	33.6
Jamaica	1990		38.4						3,638	25	43	
Jamaica	1996	1.7	40.3	67	1.0	16.4	28	24	3,526	22	40	27.5
Jamaica	1999	-2.0	37.9	69	0.9	18.6	26	9	3,481	26	42	18.7
Japan	1970		35.5						4,256	77	74	
Japan	1975	4.8	34.4	95	1.0	25.3	35	14	5,695	87	82	
Japan	1980	3.6	33.4	96	0.8	32.6	32	8	9,459	84	87	
Japan	1985	3.8	35.9	98	0.6	32.7	30	3	12,532	95	94	
Japan	1990	4.6	35.0	100	0.4	30.5	29	2	19,194	120	114	
Jordan	1986		34.9						3,440	68	96	3.0
Jordan	1992	-2.7	38.4	50	3.5	29.6	25	8	3,560	60	115	14.4
Jordan	1997	1.8	36.4	52	4.0	32.4	27	4	3,765	67	95	11.7
Jordan	2003	-0.8	36.5	53	4.2	32.7	23	2	4,106			
Kazakistan	1989		28.7						4,701			15.5
Kazakistan	1996	-4.3	35.4	83	-0.8	18.6	17	110	3,452	11	14	34.6
Kazakistan	2001	2.8	31.2	84	-0.6	23.4	18	10	5,225	18	19	
Korea Rep.	1965		34.3						710	25	23	41.4
Korea Rep.	1970	8.2	35.3	70	2.0	17.5	30	15	1,032	30	27	23.2
Korea Rep.	1975	7.8	38.0	79	1.7	15.6	30	21	1,435	34	30	20.0
Korea Rep.	1980	8.2	38.6	84	1.5	17.0	30	24	2,573	33	33	14.5
Korea Rep.	1985	5.6	34.5	87	1.4	17.5	29	8	4,155	35	35	14.2
Korea Rep.	1990	5.8	33.6	89	1.2	17.5	32	6	7,522	38	40	10.5
Korea Rep.	1995	6.2	32.0	90	1.0	19.3	37	5	11,676	57	45	7.4

Dataset *(continued)*

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Kyrgyz Rep.	1989		28.7						2,010			32.9
Kyrgyz Rep.	1996	-6.4	40.5	72	0.8	33.4	17	65	1,217	8	15	60.0
Kyrgyz Rep.	1999	5.0	37.0	73	0.8	33.9	18	32	1,349	5	13	55.0
Kyrgyz Rep.	2003	4.5	31.0	74	0.8	29.0	19	14	1,639	6	14	41.0
Latvia	1989		27.4						8,740			2.4
Latvia	1994	-5.6	27.6	82	-1.0	41.0	15	45	5,040	16	34	
Latvia	1998	4.3	32.4	81	-0.8	43.3	21	18	6,350	11	27	
Lesotho	1988		56.0						756			30.3
Lesotho	1993	3.6	57.9	21	2.3	22.6	40	15	1,341	19	34	43.1
Lesotho	1995	2.0	60.0	23	2.2	24.0	45	10	1,538	17	32	
Lithuania	1989		27.3						9,130			2.3
Lithuania	1993	-6.6	33.6	76	-0.2	33.0	22	45	6,156	19	45	
Lithuania	1996	-0.7	32.4	77	-0.2	34.2	23	36	6,800	11	17	
Lithuania	2000	4.5	31.9	78	-0.1	33.6	21	2	8,638	12	24	
Madagascar	1979		46.9						650	21	25	49.2
Madagascar	1993	-2.5	43.4	24	2.9	19.2	11	18	759	15	22	60.2
Madagascar	1997	-0.6	42.0	27	2.9	17.1	13	20	775	10	20	74.0
Madagascar	2001	1.8	47.5	29	2.9	19.0	15	8	1,102	10	23	69.5
Malaysia	1970		51.3						1,371			49.3
Malaysia	1980	4.6	49.1	41	2.9	26.3	24	4	2,318	29	46	32.5
Malaysia	1985	4.0	46.8	47	2.8	28.5	34	6	3,167	46	57	20.7
Malaysia	1990	1.8	45.7	52	2.6	29.3	28	2	4,562	65	67	17.1
Malaysia	1995	6.6	45.6	60	2.5	22.0	38	4	7,235	75	77	9.3
Malaysia	2000	2.6	44.3	70	2.4	21.0	36	3	8,884	105	99	4.0
Mali	1989		36.5						550	14	22	56.5
Mali	1994	0.4	50.5	16	2.7	24.9	21	5	609	12	23	72.3
Mali	2001	3.2	49.4	18	2.8	25.4	24	2	824	16	24	63.8
Mauritania	1990		40.1						1,217	30	18	56.7
Mauritania	1996	0.0	38.9	25	2.8	27.1	22	6	1,612	32	17	51.1
Mauritania	2000	1.5	39.0	27	2.6	29.3	26	5	1,616	29	15	46.3
Mexico	1965		55.5						1,411			
Mexico	1970	2.8	57.7	47	3.3	15.0	20	35	1,888	33	32	
Mexico	1975	3.4	57.9	51	3.1	14.7	19	40	2,526	29	31	
Mexico	1980	3.4	50.0	53	2.8	25.0	21	60	4,395	20	30	12.1
Mexico	1984	0.8	52.5	58	2.6	22.9	20	70	4,954	9	28	9.0
Mexico	1988	-2.5	55.1	61	2.4	23.2	19	80	5,966	18	22	10.1
Mexico	1995	1.1	53.7	69	2.3	20.6	19	21	7,042	30	28	17.9
Mexico	2000	1.2	54.6	70	2.1	19.5	20	16	8,837	20	26	15.0
Morocco	1985		39.2						2,040	20	44	18.0
Morocco	1990	2.8	39.3	37	2.0	28.8	21	4	2,781	28	52	13.1
Morocco	1999	1.2	39.5	40	1.8	32.5	22	5	3,384	48	73	19.0
Nepal	1985		33.4						619	10	28	38.3
Nepal	1989	3.0	35.7	40	2.6	18.3	20	12	826	12	30	40.0
Nepal	1996	3.0	36.7	52	2.5	16.6	23	8	1,152	27	38	42.0

Dataset *(continued)*

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Netherlands	1981		28.3						10,428	67	70	
Netherlands	1985	0.3	28.1	95	0.6	59.7	22	4	12,632	63	75	
Netherlands	1989	2.3	29.6	97	0.6	56.8	20	1	17,147	82	80	
Netherlands	1994	2.0	32.6	99	0.6	54.9	20	3	20,682	90	87	
New Zealand	1975		30.0						6,251			
New Zealand	1980	-0.8	34.8	85	1.0	33.0	25	20	8,490	18	27	
New Zealand	1985	1.6	35.8	87	1.1	33.7	24	12	11,447	21	32	
New Zealand	1990	2.6	40.2	90	1.2	35.3	22	11	13,586	75	75	
New Zealand	1996	1.3	36.2	93	1.2	36.7	19	2	18,030	98	88	
Nigera	1985		38.7						493	16	30	43.0
Nigeria	1993	1.5	45.0	18	3.0	17.4	12	30	812	12	24	34.1
Nigeria	1997	-0.8	50.6	20	2.8	18.5	7	35	799	12	21	
Norway	1982								12,703	34	57	
Norway	1986	3.8	22.6	88	0.4	37.0	26	8	14,540	44	60	
Norway	1990	1.3	23.7	92	0.5	39.6	24	6	18,127	65	63	
Norway	1995	2.6	25.8	97	0.5	41.7	21	3	23,924	55	56	
Norway	2000	3.7	25.8	97	0.4	37.0	21	3	29,936	69	54	
Pakistan	1970		31.5						340	25	45	46.5
Pakistan	1980	1.0	32.3	26	2.8	19.7	18	9	669	24	42	30.7
Pakistan	1985	3.6	33.4	34	2.7	21.7	17	7	952	27	41	29.1
Pakistan	1993	3.3	33.2	49	2.6	22.4	17	9	1,380	27	44	28.6
Pakistan	1999	1.3	33.0	47	2.5	22.6	16	7	1,682	28	46	32.6
Panama	1989		56.6						3,497	50	37	16.6
Panama	1996	3.7	56.3	68	2.0	27.7	22	1	5,077	64	55	10.3
Panama	2000	3.0	56.4	71	1.8	27.7	26	1	6,205	86	66	7.2
Paraguay	1990		49.7						4,050	50	20	21.8
Paraguay	1995	-0.2	59.5	57	2.7	16.2	23	16	4,605	60	29	19.4
Paraguay	1999	0.7	56.8	61	2.6	18.0	22	8	4,496	80	33	14.9
Peru	1985		45.7						3,267	9	22	
Peru	1994	-1.6	48.6	82	1.7	18.5	18	80	3,943	14	26	
Peru	2000	3.5	49.4	85	1.5	18.4	23	8	4,679	26	32	
Philippines	1985		41.0						2,373	30	28	22.8
Philippines	1988	-2.3	40.7	70	2.6	18.2	17	10	3,110	18	30	18.3
Philippines	1991	3.0	43.8	72	2.5	19.4	21	12	3,167	21	32	15.7
Philippines	1994	-1.3	42.9	75	2.4	18.4	23	8	3,332	26	43	18.4
Philippines	1997	2.7	46.2	78	2.3	18.3	24	8	3,712	47	61	14.4
Philippines	2000	0.9	46.1	79	2.2	19.0	21	6	3,897	34	59	
Poland	1989		25.5						5,740	20	41	
Poland	1993	-1.0	28.0	82	0.4	46.0	20	82	6,187	18	35	13.8
Poland	1999	5.5	31.6	85	0.2	42.7	22	27	8,901	30	40	3.0
Portugal	1985		32.0						6,948	87	85	
Portugal	1990	5.0	31.0	71	0.1	40.6	27	11	10,878	55	69	
Portugal	1998	2.8	31.6	90	0.1	39.8	25	4	15,074	78	73	

Dataset *(continued)*

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Romania	1989		23.3						5,730			14.0
Romania	1994	-6.0	28.2	75	-0.4	36.0	21	71	5,144	17	30	21.5
Romania	2000	1.0	30.3	76	-0.3	34.8	18	46	5,661	8	24	20.0
Russia	1989		27.8						8,817			5.0
Russia	1994	-6.8	43.6	83	-0.2	29.2	21	252	7,038	10	20	30.9
Russia	1996	-6.3	48.1	84	-0.1	25.2	19	30	6,045	10	19	
Russia	2000	-0.2	45.6	85	-0.1	23.7	16	42	7,260	13	22	
Senegal	1991		54.1						1,157	29	24	45.4
Senegal	1995	-1.0	41.3	18	2.7	21.0	15	3	1,594	23	24	57.9
Senegal	2001	3.0	42.6	19	2.6	20.6	18	2	2,082	19	27	53.9
Slovenia	1989		22.0						11,340			
Slovenia	1994	-1.8	25.8	88	-0.1	44.2	22	19	11,700	26	32	
Slovenia	1998	4.8	28.4	89	-0.1	44.4	21	12	14,180	31	42	
Spain	1975		37.1						4,802	74	86	
Spain	1980	0.8	33.4	76	0.8	32.9	25	27	7,074	69	80	
Spain	1985	0.6	31.8	78	0.6	42.1	22	16	8,637	66	66	
Spain	1990	4.2	32.5	86	0.4	42.0	22	6	13,129	72	73	
Sri Lanka	1965		47.0						510			37.0
Sri Lanka	1979	2.3	43.5	59	1.6	32.0	20	7	848	18	27	19.0
Sri Lanka	1987	3.8	46.7	63	1.4	31.3	24	10	1,679	20	31	27.0
Sri Lanka	1991	1.8	38.1	66	1.3	29.6	22	13	1,956	19	32	20.0
Sri Lanka	1996	4.0	41.1	68	1.2	27.7	25	11	2,804	18	35	25.0
Sweden	1975		21.3						6,748	42	60	
Sweden	1980	1.2	19.4	97	0.3	61.6	21	13	9,975	42	56	
Sweden	1985	2.0	20.5	97	0.3	64.6	20	11	12,999	41	56	
Sweden	1990	2.4	21.9	97	0.4	58.8	19	6	17,719	50	51	
Sweden	1995	0.0	25.0	99	0.4	60.0	17	3	20,305	43	45	
Sweden	2000	3.0	25.0	99	0.3	55.0	18	3	24,934	39	43	
Tajikistan	1989		30.8						1,954			51.2
Tajikistan	1999	-6.0	34.7	40	1.8	16.0	18	70	707	17	13	65.4
Tajikistan	2003	6.0	36.0	43	1.8	17.5	20	30	1,050	19	11	55.0
Thailand	1975		42.9						776	24	33	30.0
Thailand	1981	7.2	47.3	22	1.7	18.2	27	13	1,572	38	38	25.7
Thailand	1985	3.8	47.4	26	1.5	18.4	28	3	1,999	42	48	27.0
Thailand	1988	4.7	47.4	29	1.3	16.2	29	3	3,104	60	62	21.0
Thailand	1992	9.5	51.5	35	1.2	15.0	40	4	4,530	82	74	13.1
Thailand	1996	6.8	43.4	40	1.0	16.4	40	5	6,477	89	78	3.0
Thailand	2000	-1.0	43.2	47	0.8	19.0	26	7	6,777	99	98	
Tunisia	1975		50.6						3,450	34	36	
Tunisia	1980	4.2	46.1	43	2.4	34.0	29	14	2,338	39	41	
Tunisia	1985	1.4	43.0	48	2.3	36.5	28	11	2,978	48	44	11.2
Tunisia	1990	0.6	40.0	53	2.2	34.6	22	9	3,755	54	50	7.4
Tunisia	1995	2.8	41.7	67	2.1	32.8	26	7	4,780	54	48	7.6
Tunisia	2000	3.2	39.8	75	2.0	32.0	26	4	6,205	52	54	4.0

Dataset *(concluded)*

Country	Household survey year	Per capita annual growth	Inequality (GINI index)	Secondary school enroll. (%)	Pop. growth %	Gov't expend. % of GDP	Invest. as % of GDP	Inflation rate %	GNP per capita PPP (US$)	Credit as % of GDP	M2 as % of GDP	Poverty as % of pop.
Turkey	1970		56.0						1,436			
Turkey	1975	2.2	51.0	42	2.1	16.7	19	50	1,586			
Turkey	1987	1.8	43.6	46	1.9	17.1	21	40	3,933	18	26	1.5
Turkey	1994	2.9	41.5	52	1.7	23.3	22	65	4,857	15	29	2.4
Turkey	2000	2.7	40.0	58	1.6	27.0	23	60	6,189	23	48	1.0
Uganda	1989		37.3						710	4	7	62.0
Uganda	1992	4.3	39.2	25	2.8	16.1	16	40	800	4	7	56.0
Uganda	1996	4.8	37.4	26	3.0	18.2	16	8	1,070	5	9	44.0
Uganda	2000	4.3	40.5	28	3.2	19.0	19	3	1,230	6	14	35.0
Ukraine	1989		23.5						7,210			6.0
Ukaine	1992	-6.8	25.7	75	-0.2	40.0	23	89	6,315	5	27	11.0
Ukraine	1998	-4.8	32.5	76	-0.2	38.4	21	39	3,547	8	15	26.0
United Kingdom	1977		27.0						5,901	28	38	
United Kingdom	1980	2.7	28.0	88	0.2	44.9	19	15	9,175	33	35	
United Kingdom	1985	1.0	29.0	89	0.2	46.5	18	8	11,711	50	39	
United Kingdom	1990	4.0	36.0	90	0.3	40.1	18	6	16,857	100	75	
United Kingdom	1995	0.8	36.0	92	0.3	42.8	17	4	20,446	110	70	
Uruguay	1989		42.2						12,521	38	53	
Uruguay	1995	2.0	42.7	63	0.6	29.0	14	45	12,457	25	42	
Uruguay	1999	3.0	43.8	65	0.6	32.0	13	15	12,521	41	44	11.0
Uruguay	2002	-3.0	44.6	68	0.6	33.0	14	6	12,118	60	66	12.0
USA	1971		39.4						7,044	52	64	
USA	1975	1.8	39.7	90	0.9	30.7	19	8	8,166	58	65	
USA	1980	2.8	40.3	90	0.9	33.7	19	11	13,016	60	63	
USA	1985	1.4	41.9	92	1.0	36.7	19	6	16,903	59	64	
USA	1990	2.8	42.8	94	1.0	35.3	19	4	23,444	64	67	
USA	1997	1.3	40.8	96	1.0	33.3	19	3	30,113	58	60	
Venezuela	1981		48.0						5,700	29	39	6.3
Venezuela	1987	-4.0	53.5	24	2.6	24.0	20	12	6,300	25	35	8.5
Venezuela	1995	0.7	46.8	35	2.4	20.0	19	40	8,510	14	29	9.4
Venezuela	1998	0.0	47.6	44	2.3	20.6	18	50	8,939	11	18	10.0
Vietnam	1993		35.7						8,939	5	21	50.9
Vietnam	1998	6.6	36.1	44	2.1	19.7	28	9	1,744	18	30	37.4
Vietnam	2002	2.3	36.4	55	2.1	20.8	28	4	2,240	41	53	28.9
Zambia	1990		48.3						973	10	30	58.6
Zambia	1993	-3.5	46.2	38	2.8	28.0	12	110	1,056	10	23	62.0
Zambia	1996	-5.6	49.8	40	2.6	22.4	29	45	934	6	18	69.2
Zambia	1998	2.5	52.6	42	2.4	25.6	32	25	915	7	17	72.9

References

Adams, Richard, and John Page, 2003, "Poverty, Inequality and Growth in Selected Middle East and North Africa Countries," *World Development,* Vol. 31, pp. 2028–46.

Ahluwalia, M., 1976, "Income Distribution and Development," *American Economic Review*, Vol. 66, No. 5, pp. 128–35.

Alesina, A., and D. Rodrik, 1994, "Distributive Politics and Economic Growth," *Quarterly Journal of Economics*, Vol. 109, pp 465–90.

Anand, S., and S. M. Kanbur, 1993, "The Kuznets Process and the Inequality-Development Relationship," *Journal of Development Economics*, Vol. 40, pp. 25–72.

Arellano, M., and S. Bond, 1991, "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies,* Vol. 58, pp. 277–97.

Arellano, M., and O. Bover, 1995, "Another Look at the Instrumental Variable Estimation of Error-Components Models," *Journal of Econometrics*, Vol. 68, pp. 29–51.

Baltagi, B. H., 2001, *Econometric Analysis of Panel Data,* 2nd ed. (New York: John Wiley & Sons).

Barro, Robert, 2000, "Inequality and Growth in a Panel of Countries*," Journal of Economic Growth*, Vol. 5, pp. 5–32.

Bourguignon, F., 1981, "Pareto Superiority of Unegalitarian Equilibrium in Stiglitz's Model of Wealth Distribution with Convex Saving Function," *Econometrica*, Vol. 49, pp. 1469–75.

Clarke, George R., 1995, "More Evidence on Income Distribution and Growth," *Journal of Development Economics*, Vol. 47, pp. 403–27.

Deininger, Klaus, and Lyn Squire, 1996, "A New Data Set Measuring Income Inequality," *World Bank Economic Review*, Vol. 10 (September), pp. 565–92.

de Ferranti, David, Guillermo Perry, Francisco Ferreira, and Michael Walton, 2004, Inequality in Latin America: Breaking with History? (Washington: World Bank).

Fischer, Stanley, 1993, "The Role of Macroeconomic Factors in Growth," *Journal of Monetary Economics*, Vol. 32, pp. 485–512.

Forbes, K., 2000, "A Reassessment of the Relationship between Inequality and Growth," *American Economic Review*, Vol. 90, pp. 869–97.

Galor, O., 2000, "Income Distribution and the Process of Development," *European Economic Review*, Vol. 44, pp. 706–12.

———, and O. Moav, 1999, "From Physical to Human Capital Accumulation: Inequality in the Process of Development," CEPR Discussion Paper No. 2307 (London: Center for Economic Policy Research).

———, and J. Zeira, 1993, "Income Distribution and Macroeconomics*," Review of Economic Studies*, Vol. 60, pp. 35–52.

Iradian, G., 2003, "Armenia: The Road to Sustained Rapid Growth, Cross-Country Evidence," IMF Working Paper 02/103 (Washington: International Monetary Fund).

Johnston, J., and J. DiNardo, 2000, *Econometric Methods* (New York: McGraw-Hill).

Kaldor, N., 1957, "A Model of Economic Growth," *Economic Journal*, Vol. 67, pp. 591–624.

Keefer, P., Knack, S., 2000, Polarization, Politics and Property Rights: Links Between Inequality and Growth, Policy Research Working Paper, No. 2418, August (Washington: World Bank).

King, R., and R. Levine, 1993, "Finance, Entrepreneurship, and Growth: Theory and Evidence," *Journal of Monetary Economics*, Vol. 32, pp. 513–42.

Kuznets, Simon, 1955, "Economic Growth and Income Inequality," *American Economic Review,* Vol. 45, No.1 (March), pp. 1–28.

Li, H., L. Squire, and H. Zou, 1998, "Explaining International and Intertemporal Variations in Income Inequality," *Economic Journal*, Vol. 108, pp. 26–43.

Panizza, Ugo, 2002, "Income Inequality and Economic Growth: Evidence from American Data," *Journal of Economic Growth*, Vol. 7, pp. 25–41.

Perotti, Roberto, 1996, "Growth, Income Distribution, and Democracy: What the Data Say," *Review of Economic Studies*, Vol. 60, pp. 755–76.

Ravallion, Martin, 1997, "Good and Bad Growth: The Human Development Reports," *World Development*, Vol. 25, pp. 631–38.

———, and Shaohua Chen, 2003, "Measuring Pro-Poor Growth," *Economic Letters*, Vol. 78, pp. 93–99.

Smith, D., 2001, "International Evidence on How Income Inequality and Credit Market Imperfections Affect Private Saving Rates," *Journal of Development Economics*, Vol. 64, pp. 103–27.

Tanzi, Vito, Ke-young Chu, and Sanjeev Gupta, eds., 1999, *Economic Policy and Equity* (Washington: International Monetary Fund).