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POVERTY, GROWTH, AND INEQUALITY OVER THE NEXT 50 YEARS

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SUMMARY

Global poverty has fallen dramatically over the last two centuries, and the fall has intensified in recent decades, raising hopes that it could be eliminated within the next 50 years. As industrialization, specialization, and trade raised economic growth and living standards in Western Europe and the European offshoots in the 19th century, much of the rest of the world also started growing rapidly after 1950.

Poverty reduction, however, has been very uneven across countries. Since 1980, China alone accounted for most of the world's decline in extreme poverty. Even though there has been a huge rise in income inequality within China, economic growth has been so strong that hundreds of millions of people have risen out of extreme poverty and the poverty ratio has plummeted. Sub-Saharan Africa, at the other extreme, has seen its poverty headcount continue to rise; the negative impact of low economic growth has far outweighed modest improvements in within-country income inequality.

Strong economic growth is the key to future poverty reduction. If the lagging non-OECD[2] (Organisation for Economic Co-operation and Development) countries are able to transition to a sustainable higher growth path, the global poverty ratio will fall from about 21 percent in 2005 to less than 2.5 percent in 2050 and the number of people living in absolute poverty will decline another billion people. While the historical record is clear that market-friendly policies and competent governance are critical to growth, few economists are bold enough to claim they know the precise combination of policies, and how to implement and sustain those policies, to achieve this economic transition. Forecasts of future economic growth rates and poverty rates are necessarily speculative and depend on a large number of assumptions about human behavior and policy decisions that are impossible to know in advance.

In a less optimistic scenario, I assume that the regions that have been lagging, especially sub-Saharan Africa, do not improve upon their growth rates of the last 25 years. This results in much higher poverty levels—almost 900 million more people living in absolute poverty in 2050 than in the optimistic scenario. I have also considered, but not explored empirically, even more depressing scenarios. Resource constraints, if not met by technological solutions, will surely make the poverty estimates shown here worse. A breakdown of the world capitalist system or even a gradual turning away from the system that has done so much to reduce global poverty over the last two centuries would be disastrous.

POVERTY MEASUREMENT

Before modern economic growth took off in a few countries in Western Europe, a few European offshoots and Japan—a group of countries hereafter referred to as the OECD—living standards were in all countries very low on average by modern standards. Maddison[3] (2003) estimated OECD gross domestic product

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[2] The author divides countries into two groups: the OECD countries as of 1981 (Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Portugal, New Zealand, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and United States of America), and the Non-OECD countries (even though some of the latter group are now part of the OECD).

[3] Maddison actually estimated $1109 and $578 in 1990 purchasing power parity prices but all his figures have been revised in this paper into 2005 prices. See the technical appendix for a brief discussion of purchasing power parity and inequality measures such as the Gini coefficient and the Lorenz curve.

(GDP) per capita in 1820 at about $1571 in 2005 purchasing power parity dollars (PPP) versus $730 on average in the non-OECD countries. Rising economic growth in the OECD countries over the next century raised incomes and cut poverty dramatically, leaving the non-OECD countries far behind. Bourguignon and Morrisson (2002) attempted to combine measures of income distribution within countries with cross-country GDP measures to get a measure of the global distribution of income and a global measure of poverty. Their paper tells a dramatic and straightforward story. Global poverty rates have fallen sharply, from 85.2 percent in 1820 to 31.3 percent in 1980, as economic growth everywhere far outpaced population growth. But they also showed that the global distribution of income became much more unequal. Global inequality was high in 1820 (Gini coefficient of 50.0) and it rose over the next 160 years, reaching 65.8 in 1980. In the early 19th century, most inequality was due to differences within countries, but most of the rise since 1820 has been due to differences in growth rates among countries. Economic growth, per capita, in the OECD countries was twice as fast as in the non-OECD countries, 1820 to 1980. The figures shown in Table 1 below present an introduction to the historical data on growth and poverty, mainly based on the work of Maddison (2001) and Bourguignon and Morrisson (2002), on recently updated work on poverty by Chen and Ravallion (2008), and on long-run poverty forecasts that will be discussed in this paper.

Table 1

Long Run Estimates of Growth and Poverty

						Alternative Forecasts	
						Market Firs	Trend Growth
World	1820	1950	1980	1981	2005	2050	
GDP (billions of 2005 ppp $)	913	7,006		26,825	56,593	309,569	193,318
Population (millions of people)	1,041	2,525		4,511	6,458	9,301	9,301
GDP per capita (2005 ppp $ per year)	876	2,775		5,947	8,764	33,285	20,785
average annual percent change from previous period							
Absolute Poverty Headcount (millions)	887	1,376	1,390	1,896	1,377	245	1,120
Absolute Poverty Ratio	85.2%	54.5%	31.3%	42.0%	21.3%	2.6%	12.0%
Inequality Index (Gini coefficient)	50	64	65.8	70.9	68.4	64.8	67.9
Non-OECD							
GDP (billions of 2005 ppp $)	628	2,702		11,324	26,008	189,980	112,177
Population (millions of people)	860	1,947		3,744	5,561	8,310	8,310
GDP per capita (2005 ppp $ per year)	730	1,388		3,024	4,677	22,861	13,498
average annual percent change from previous period		0.5%		2.5%	1.8%	3.6%	2.4%
Absolute Poverty Headcount				1,896	1,377	245	1,120
Absolute Poverty Ratio (share of Non-OECD population)				50.6%	24.8%	2.9%	13.5%
OECD							
GDP (billions of 2005 ppp $)	284	4,304		15,501	30,585	119,589	81,142
Population (millions of people)	181	578		767	897	990	990
GDP per capita (2005 ppp $ per year)	1,571	7,446		20,222	34,089	120,756	81,933
average annual percent change from previous period		1.2%		3.3%	2.2%	2.9%	2.0%

Note: the Gini coefficient is calculated on an individual basis: it uses information on within country income distribution.

Sources: GDP 1981-2005 from World Development Indicators, earlier years linked from Maddison (2001).

Population, 1981-2005 from World Development Indicators, earlier years linked from Maddison (2001)

Poverty Headcount and Ratios: 1981-2005 from Chen and Ravallion (2008); 1820-1980 from Bourguignon and Morrisson (2002)

Gini coefficients, 1981-2005 are author's calculations; 1820-1980 from Bourguignon and Morrisson.

The forecast numbers will be explained in the text below.

And while the poverty ratio was falling, the number of people living in absolute poverty—measured at the $1.25 a day standard in purchasing power parity dollars[4]--kept growing, from under 900 million in 1820 to almost 1.4 billion in 1980 (Bourguignon and Morrisson, 2002).

Subsequent work by Bhalla (2002), Sala-i-Martin (2002a, 2002b), Chen and Ravallion (2004), and Hillebrand (2008), extended the analysis from 1980 and found a pronounced downward trend in poverty

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[4] The new standard is $1.25 a day, measured in 2005 purchasing power parity dollars. Previous measures of absolute poverty were at $1 a day using 1985 price levels and $1.08 using 1993 price levels. While this paper uses $1.25, or $2.50 a day as poverty threshold figures it should be understood that these figures are consistent with earlier literature using the $1 a day standard.

headcounts and poverty ratios, mainly because of very rapid economic growth in China and India. The conclusions on global inequality are more mixed. Bhalla, Sala-i-Martin, and Bourguignon and Morrisson show a downward trend in global income inequality from 1980. Milanovic (2005) and Hillebrand (2008) show little trend, at least until the late 1990s or early 2000s.

Poverty estimates made prior to late 2008 have been thrown into doubt by the release of new purchasing power parity price estimates by the International Comparison Project (2008). This new study is based on a much more complete global survey of prices (and one that includes China for the first time) and presumably gives a much more accurate measure for gauging cross-country differences in income and consumption (Heston, 2008). The major impact of this new work is that price levels for most of the non-OECD economies have been revised upward, meaning that income, production and consumption levels have been revised sharply downward, most importantly for China and India (Table 2).

Table 2
New and Old Estimates of GDP Per Capita in 2005

Dollars in 2005 prices, but based on different estimates of prices

	2005 ICP	2005 WDI	2005 PWT63	2005 Exchange Rate
China	4,091	6,760	6,637	1,721
India	2,126	3,452	3,536	707
Japan	30,290	30,736	27,726	35,604
United States	41,674	41,674	41,674	41,674

Source: Heston (2008)
Note: WDI refers to World Development Indicators, the World
Bank's data base. PWT63 refers to Penn World Tables, version 63.

A new paper by Chen and Ravallion (2008) makes use of the 2005 ICP purchasing power parities estimates to create new estimates of global poverty, 1981-2005, which are hundreds of millions of people higher than their own previous calculations or the other estimates appearing in the literature[5] (Table 3). The new Chen-Ravallion poverty numbers, while obviously pointing in a direction consistent with the revisions of GDP per capita shown in Table 1, raise numerous questions of their own: has the calculated fall in Chinese poverty[6] really been so dramatic? Heston (2008) asserts that the implied Chinese growth going very far backward is implausible. Has the fall in Indian poverty really been so small compared to Bhalla's calculations? Bhalla (2005) asserts that the household surveys which underpin the Chen-Ravallion poverty estimates badly underestimate total Indian consumption. Why are the implicit aggregate consumption figures for many countries so different from national income account figures? The aggregate consumption share figure falls dramatically in both China and India leading to far higher estimates of poverty than consumption figures from the National Accounts would suggest. Some of these questions may be answered when more details of the ICP 2005 are released and when the Penn World Tables completes its analysis of the data but some will probably linger indefinitely due to disagreements over data and methodology.

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[5] The data revision, not changed economic circumstances, account for the huge jump in the estimate of people living in absolute poverty in 1981 as estimated by Chen and Ravallion compared to 1980, and as estimated by Bourguignon and Morrisson. The new price data will presumably cause the 1820-1980 poverty estimates to be revised upward too, but this work has not yet been done.

[6] See Appendix Table 1 for the Chen and Ravallion poverty headcount estimates by country, for 1981 and 2005.

Table 3
New and Old Poverty Estimates for 2005

Millions of people with consumption below $1.25 per day in 2005

	Chen/Ravallion 2008	WDI 2007	Hillebrand 2008
China	208	77	131
India	456		163
Sub-Saharan Africa	391		427
World	1377	977	965

Source: C hen and Ravallion (2008) and Hillebrand (2008). The WDI numbers
are World Bank updates of the Chen-Ravallion (2004) calculations for 2001.

In any case, all poverty figures are estimates, based on imperfect data, and on many different, challengeable, assumptions about how to put the data together to come up with the global inequality measures and poverty headcounts. For now, the Chen-Ravallion figures are the most up-to-date and comprehensive estimates available. The poverty numbers in the Chen-Ravallion 2008 paper, and the underlying estimates for 119 countries made available through the World Bank's Povcal website[7], will constitute the starting point for this paper's estimates of poverty through 2050.

EXPLAINING CHANGES IN POVERTY, 1981-2005

World poverty fell dramatically, 1981-2005, according to estimates by all the sources cited above, including the new Chen-Ravallion work. All sources also agree that most, if not all of the gains, were due to huge decreases in the Chinese poverty headcount. According to Chen and Ravallion the world absolute poverty headcount fell by over 500 million people, 1981 to 2005,[8] and the world poverty headcount ratio fell from 42 percent to 21.3 percent (Table 4). The poverty headcount in China alone, however, fell by over 600 million. In only 24 years China went from 84 percent of its people living below the $1.25 a day absolute poverty level to having less than 17 percent of its people so impoverished. Some other large countries (Brazil, India, Indonesia, Mexico, Pakistan, South Africa and Vietnam) also showed dramatic reductions in the poverty ratio, and, sometimes the poverty headcount as well (the data for all 119 countries in the World Bank database are shown in Appendix Table 1).

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[7]

http://web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTPROGRAMS/EXTPOVRES/EXTP
OVCALNET/0,,contentMDK:21867101~pagePK:64168427~piPK:64168435~theSitePK:5280443,00.html

[8] All historical poverty figures from this point forward in the paper will be taken from Chen and Ravallion (2008) or from the World Bank's Povcal website which contains more details than included in the 2008 paper.

Table 4
World Poverty Headcounts and Poverty Ratios, 1981 and 2005

	1981	2005	1981	2005
	Poverty Headcount (millions)		Poverty Headcount Ratios	
World	1896	1377	42.0%	21.3%
East Asia	1072	316	77.7%	16.8%
China	835	208	84.0%	15.9%
Indonesia	108	47	71.5%	21.4%
Vietnam	49	19	90.4%	22.8%
South Asia	548	596	59.4%	40.3%
India	421	456	59.8%	41.7%
Pakistan	62	35	72.9%	22.6%
Latin America	42	46	11.5%	8.4%
Brazil	21	14	17.1%	8%
Mexico	6.8	2	9.8%	1.7%
Sub-Saharan Africa	214	391	53.7%	51.2%
Congo, DR	9	35	31.9%	59.2%
Nigeria	35	88	47.2%	62.4%
Republic of South Afirca	10	10	34.9%	20.6%
East Europe and Central Asia	7	17	1.7%	3.7%
Middle East/North Africa	14	11	7.9%	3.6%

Source: Chen and Ravallion (2008), except that I divide the world headcount by world population.

Sub-Saharan Africa, on the other hand, saw a huge increase in the number of people living in absolute poverty and only a small decrease in the poverty ratio. Only four (out of 42) sub-Saharan African countries (Cape Verde, Mauritania, Senegal and South Africa) recorded a fall in poverty headcounts, while a dozen African countries recorded increases in poverty headcount ratios and a few countries (the Democratic Republic of the Congo, Nigeria and the United Republic of Tanzania) showed tens of millions more people living in absolute poverty in 2005 than in 1981. Faster economic growth in the last decade, though, has led to a slight decline in the Sub-Saharan Africa poverty ratios since 1996 (Figure 1).

Changes in the poverty headcount of any country can be ascribed to one of three factors: aggregate per capita economic growth, changes in the share of aggregate gross domestic product (GDP) going to private consumption versus the other components of GDP[9], and distribution of consumption among individuals within each country.[10] For example, if the share of GDP going to consumption remained the same in 2005 as in 1981, and the distribution shares across the population remained the same, all the differences in poverty levels could be explained by changes in economic growth.

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[9] Investment, government consumption, and net exports.
[10] Measured by estimated Lorenz curves and the SAP methodology.

Figure 1

Sub-Saharan Africa: Trends in GDP per capita and the Poverty Headcount Ratio

Real GDP per capita, 2005 PPP, 1981=100	
Poverty Headcount ratio Index, 1981=100	
Author estimate	
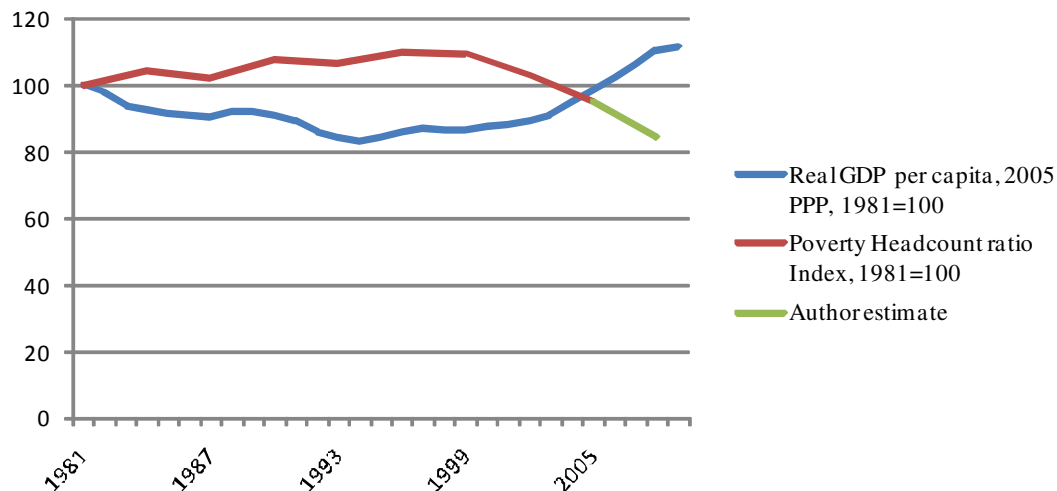
Source: Poverty Headcount ratio from Chen and Ravallion (2008). Estimate of 2008 by author. GDP per capita from WDI database

Economic growth in the non-OECD countries over-determines the estimated fall in poverty headcounts (Table 4). Had Lorenz curves and consumption ratios remained constant the world poverty headcount would have fallen from 1896 million people in 1981 to 791million in 2005, not the actual figure of 1377 million estimated by Chen and Ravallion. Declines in the aggregate consumption ratio and shifts in distribution combined to increase the poverty headcount by almost 600 million people from what it would have been if aggregate and by-person distribution had remained at 1981 levels.

Even though China started with an extremely high rate of absolute poverty, its rate of real per capita economic growth was so high (8.8 percent a year[11]) that even the estimated consumption of the lowest 10 percent of the population would by 2005 have far surpassed the $1.25 a day per person absolute poverty standard had not the overall amount of GDP going to consumption dropped sharply and the inequality of distribution of that total amount of consumption increased sharply.[12] Poverty headcounts were down in most other East Asian countries as well. Indonesia and Vietnam cut their poverty headcounts sharply by combining strong economic growth without adversely affecting consumption ratios. The Philippines was the worst performer in the East Asian region: the poverty headcount went up 3.7 million people, mainly because of low economic growth.

India had high economic growth, 3.3 percent per year, fast enough to raise 364 million people out of absolute poverty had not the distribution of income and consumption changed so greatly. But the ratio of aggregate consumption to GDP fell by about 20 percentage points over this period, and aggregate consumption was distributed more unevenly, with the overall Gini coefficient on household consumption rising about 4 percentage points. Pakistan performed better than India. Its poverty headcount went down and its poverty ratio dropped dramatically, from 72.9 percent to 22.6 percent, according to the Chen-Ravallion numbers. Its economic growth was weaker than India's, but it did not have the dramatic decline in the ratio of private consumption to GDP.

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[11] 1982-2005, see World Development Indicators data base, 2009, using GDP per capita in 2005 ppp $.

[12] The World Income Inequality Database suggests that aggregate Chinese Gini coefficient rose about 15 points, from 29 to 44 over this period, while the Indian Gini coefficient rose about 4 points, from 32 to 36 (http://www.wider.unu.edu/research/Database/en_GB/database/).

Table 5

Impact of Economic Growth and Distribution Shifts on Poverty Head Counts

millions of people

	1981	2005	Total Change	Change due to GDP Growth	Change due to Shifts in Aggregate Consumption Ratio	Change due to Income Distribution Shifts (shifts in lorenz curves)
World	1896	1377	-520	-1105	344	241
East Asia	1072	316	-755	-957	21	181
of which China	835	208	-627	-835	38	170
South Asia	548	596	47	-389	362	75
of which India	421	456	35	-364	324	75
Sub-Saharan Africa	214	391	177	252	-63	-11
Latin America and Caribbean	41	44	3	-3	21	-15

Source: The 1981 and 2005 poverty headcounts are from Chen and Ravallion.

Growth and distribution shifts are estimated by the author. (sums may not total due to rounding)

Sub-Saharan Africa had very negative results. Average real GDP growth was slower than population growth and would—without favorable distributional changes—have caused poverty headcounts to double. The worst performers were Côte d'Ivoire and Democratic Republic of the Congo. These two conflict-torn countries had average negative GDP per capita growth of 2 percent and 4 percent per year, respectively. The ratio of consumption to GDP soared but not enough to compensate for the growth effects. Nigeria also had very negative results, with the poverty headcount rising almost 54 million people and the poverty ratio rising from 18 to 62.4 percent. Nigeria had a toxic combination of low GDP per capita (0.7 percent per year), a sharp fall in the ratio of private consumption to GDP (from 42 to 28 percent) and a rise in consumption inequality (the Gini coefficient rose from 38.7 to 42.9). The Republic of South Africa was one of the best performers on the continent. It had low economic growth (-0.2 percent), but a large increase in the consumption ratio (from 43 to 53 percent), and a slight decrease in inequality (the Gini coefficient fell from 59 to 58).

Latin America has higher average incomes and less absolute poverty than Asia and sub-Saharan Africa. Because it didn't have much absolute poverty to begin with in 1981 it did not take much per capita GDP growth to push more people above the poverty threshold as long as distribution did not change adversely. Per capita real GDP growth was only 0.7 percent per year, 1981-2005, but the regional consumption ratio average rose two percentage points, and the population-weighted regional Gini coefficient rose only slightly. Mexico and Brazil have made dramatic progress from 1981. Brazil has brought its poverty headcount down by almost 7 million people and its poverty ratio has shrunk from 17 percent in 1981 to 7.8 percent in 2005. Mexico has reduced its poverty headcount by 4.9 million people while shrinking its poverty ratio from 9.8 percent in 1981 to 1.7 percent in 2005. Argentina, Bolivia, Peru, and Venezuela all saw sharp increases in their poverty ratios between 1981 and 2002, but both the headcount and the poverty ratio showed a large decrease between 2002 and 2005, according to the Povcal database.

Trends in global inequality, 1981-2005

Chen and Ravallion do not report any calculations of global inequality. In my 2008 paper I report several different estimates of global inequality (Table 6). Most of these (Milanovic is the exception) use estimates of within-country income or consumption distributions and multiply those distribution times the value of income or consumption taken from the national income accounts. Milanovic would say that a better measure would be to distribute the total consumption by country inferred from the household consumption surveys. I have taken the data for the 119 countries included in the Povcal database and added consumption figures for the additional 63 countries covered in my database from various sources (but mostly using aggregate consumption data in 2005 purchasing power parity terms) and used Bhalla's standard accounting procedure (SAP) to calculate world Gini coefficients which fell slightly 1981-2005, mainly because of strong economic growth in Asia.[13]

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[13] Using the 2005 ICP Milanovic (2008) has also revised upward his estimate of global inequality. His new estimate for the global Gini coefficient in 2002 is 69.9 compared to his previous estimate of 65.3. See the technical appendix for details on the SAP.

Table 6
World Gini Estimates

	1820	1970	1980	1981	1988	1992	1993	1998	2005
Bourguignon/Morrisson	0.50	0.65	0.657			0.657			
Bhalla			0.686			0.678		0.654	
Sala-i-Martin			0.662			0.645		0.633	
Milanovic					0.619		0.652	0.642	
Hillebrand			0.653						0.634
2009 estimate using 2005 ICP data				0.709					0.684

Sources: Bourguignon and Morrisson (2002), Bhalla (2002), Sala-i-Martin (2002b),
Milanovic (2005), Hillebrand (2008) and new estimates by author.

FORECASTING ECONOMIC GROWTH

Forecasting poverty 40 years in the future is mostly a matter of forecasting economic growth. Bourguignon and Morrisson claimed that economic growth had by far the greatest impact on global poverty inequality, 1820-1992. We know from Ravallion (2001) and Dollar and Kray (2002) found that the poor on average tend to share proportionately in the gains from economic growth. And we have seen in the above analysis of the Chen-Ravallion poverty data set that economic growth far outweighed the impact of the other two proximate causes: the distribution of national output between consumption and other uses, and changes of distribution by person in each country.

Economists have long relied on the neoclassical growth model (Solow, 1956) to think about economic growth. Economic growth, in Solow's framework, depends on changes in the capital stock (machinery, buildings, roads, communication lines, etc.), changes in the labor force, and changes in technology. In this model diminishing returns eventually set in and growth slows unless technological change intervenes to keep productivity increasing.

Changes in technology, according to empirical research by Abramowitz (1956) and many others, have contributed the major part of long-run economic growth in the OECD countries, and thus should be important to forecasts of the future. While changes in capital and labor are relatively simple to model and forecast, however, technology is not. Solow treated the technological change component as a residual or exogenous factor, not explainable by growth theory. Later researchers, especially Romer (1987, 1990), Grossman and Helpman (1991), and Barro and Sala-i-Martin (1995) have attempted to "endogenize" growth theory by trying to explain theoretically (and demonstrate empirically) the causal forces underlying technological progress, especially investment in research and development, but also institutional factors such as protection of property rights, regulation of international trade, and taxation.

An important corollary of the extended neoclassical growth model for poverty analysis is the convergence concept. It is implicit in the neoclassical growth model that poor countries should grow faster than rich countries and should eventually catch up—converge—in per capita output and income. According to Barro (1998, p 1): "If all economies were intrinsically the same except for their starting capital intensities, … poor places would tend to grow faster per capita than rich ones." Because rich countries are limited by diminishing returns and poor countries can grow faster by increasing capital stocks and adopting best-practice technology, incomes ought to eventually converge. Lucas (2000) makes use of this convergence concept to predict rapid non-OECD growth and a convergence of incomes by 2100.

Douglas North (2005), on the other hand, believes that neo-classical economic theory by itself is not much help in explaining the process of economic change—institutions are more important. Economies are composed of institutions that provide incentives for work, trade, saving, and investment—or not. Institutions that stifle competition and encourage predation might well arise and persist, contra to the convergence hypothesis, because institutions poorly designed for economic growth might be admirably suited for maintaining the power and prosperity for those in command or might be based on cultural beliefs that do not value economic growth highly. Paul Collier (2007) warns us that bad governance is only one of the four

poverty traps that can keep countries down[14]. Mancur Olson (1982) suggests that even rich and prosperous countries, which achieved prosperity through good institutions, are constantly at risk of economic sclerosis as special interests accrue power over time through lobbying and politics to undermine the institutions that spur competition and investment.

Most long run economic growth forecasts that appear in the literature are based on modeling exercises that use neoclassical and endogenous growth theory, the convergence concept, and some reference to the institutional ideas of North and Olson and others. While there is much to criticize and debate in the theoretical literature, it is also important to note that the empirical estimates of the underlying relationships are also contentious, with the magnitude of the relationships and even the direction of causality often in dispute. Any forecasting effort also requires many assumptions about policy choices by future governments over long periods of time; long-run forecasting efforts are necessarily speculative.

Forecasting Poverty and Inequality

What will global poverty look like in 10 or 20 or 45 years? Not many explicit forecasts appear in the literature. Chen and Ravallion (2004, p. 33) using the old ICP data suggest it will drop, but their estimate is based on two time series regressions (one for East Asia, one for South Asia) based on past changes in the poverty headcount relative to assumptions about long-term economic growth. They assume that the poverty ratio in Africa will continue to be 45 percent. Their modeling and assumptions add up to a world poverty rate of 15 percent in 2015, thus meeting the Millennium Development Goals.

Bhalla (2005) concluded that the world poverty rate has already gone below 15 percent and will continue to go lower. Bhalla estimated a reduced-form equation to calculate the elasticity of the poverty headcount ratio to growth in incomes or consumption and then used this regression model to forecast future poverty levels assuming the distribution of income or consumption within countries remains the same.

The World Bank has been making forecasts of the 2015 world poverty rate in its *Global Economic Prospects* series since 2001. In the latest edition (2009) the 2015 forecast is revised upward from 10.2 percent to 15.5 percent because of the ICP revisions. These forecasts apparently use a cross-country regression that posits a constant elasticity of poverty reduction to per capita income growth adjusted by estimates of changes of within-country inequality. The constant elasticity assumption is not very reliable for extending projections very far in the future given that we are talking about movements below or above a fixed poverty threshold. A country with incomes just below the threshold can cross the threshold with only a low level of growth and a country with incomes far below the threshold can have high rates of growth without moving many people out of extreme poverty. A different forecasting methodology is clearly needed.

Hughes and his colleagues (2008) in a major new study review past poverty forecasting efforts in detail and present their own set of forecasts to the year 2055 using the "lognormal" distribution to convert estimates of average income and the Gini coefficient into poverty headcounts. This methodology has the advantage of embedding the poverty estimates directly into a long range macroeconomic simulation model (the International Futures Model[15]) so the authors of the paper or any user of the model can directly test not only the impact of alternative assumptions about economic growth on poverty futures, but also simulate the effects of changes in a wide variety of policy levers on economic growth and hence on poverty. The Hughes estimates are based on the old ICP data and so are not directly comparable to the new Chen-Ravallion numbers that form the basis of this study.

This paper uses an alternative methodology. If we have estimates of future GDP, if we assume the within-country distribution of income and consumption remains constant, and if we assume the ratio of consumption to income is constant, we can simply read off the percentiles of income and consumption using the same accounting framework we did in the historical analysis. All three of these key "ifs" are problematic. There is no scientifically sound methodology to forecast global incomes and consumption decades in the future. Most long-term projections, including this one, rely on scenarios. The researcher posits a set of assumptions about the key drivers of growth, uses a model that relates these factors to economic outcomes, and produces

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[14] The others are (1) conflict and political violence, (2) abundance of natural resource wealth that distorts economic growth and (3) geographical disadvantages such as being landlocked, poor in resources or harried by bad neighbors.
[15] See Hughes and Hillebrand (2006).

projections that are presumed to be part of a range of plausible outcomes. The assumption of unchanging within-country distribution is also one that is often made in long-run forecasts (see Chen and Ravallion, 2004a), mainly because there is little scientific basis for predicting long-range changes and the existing empirical work on the subject shows such divergent results (see World Bank (2007) versus Higgins-Williamson (2002)). Consumption-to-GDP ratios could also change for endogenous economic reasons or because of political decisions, but are assumed in this paper to remain constant.

The World Bank poverty estimates tell a good-news story about global poverty from 1981 to 2005, but it is likely that the very high economic growth recorded by the non-OECD drove poverty headcounts down further through 2008. Using actual GDP growth rates between 2005 and 2008 and assuming no changes in within-country distributions, I estimate the global poverty headcount fell over 200 million and the poverty headcount ratio declined to about 18 percent (Table 7).

Table 7
Poverty Estimates for 2008

	2005		2008		2006-2008
	Poverty Headcount	Poverty Ratio	Poverty Headcount	Poverty Ratio	Average annual growth in real *per capita* GDP
Non-OECD	1,377	21.3%	1,132	17.6%	4.6%
East Asia	316	16.8%	247.2	15.9%	5.7%
China	208	15.9%	148	12.3%	7.5%
South Asia	596	40.3%	467	30.2%	4.4%
India	456	41.7%	339	29.9%	4.9%
Latin America and Caribbean	46	8.4%	36	6.6%	3.0%
Sub-Saharan Africa	391	51.2%	352	44.3%	2.9%

Source: 2005 Poverty estimates from Chen and Ravallion (2008); 2006-2008 growth rates from WDI and The Economist magazine. 2008 Poverty estimates are author's calculations based on SAP methodology but adjusted upward based on the World Bank's estimate of the impact of rising commodity prices on the poor. (World Bank, 2009, pg 117)

The analysis relies on the SAP methodology described above and a spreadsheet model that estimates average consumption by percentile of population for 182 countries. The poverty and inequality estimates from the SAP model are driven by population and economic growth numbers that are derived from scenarios produced with the International Futures (IFs) model. The IFs model is convenient because it contains detailed growth models for 182 states, contains numerous policy levers that have been calibrated based on recent empirical work at the World Bank and elsewhere, and because the model already contains numerous well thought-out long range growth scenarios. It will become clear that slightly varying assumptions about a small number of key parameters can have very large effects on global poverty and inequality. The poverty forecasts presented below will be based on two scenarios. The Market First scenario will assume rapid technological change in the OECD countries, a strong tendency toward convergence in the non-OECD countries based on globalization, pro-growth policies, and institutional change. The Trend Growth scenario will assume less technological change, less globalization, and less improvement in economic governance in the slow-growth regions.

THE "MARKET FIRST" SCENARIO

The "Market First" scenario is based on the IFs default scenario as of October, 2008. It was compiled by the IFs team at the University of Denver using an optimistic set of assumptions consistent with global analysis from the United Nations and the National Intelligence Council.[16] The World Bank elaborated a similar scenario in its Global Economic Prospects: Managing the Next Wave of Globalization (2007). As in the World Bank work, the numbers used here are not a forecast but a scenario based on assumptions about changes in population, capital stock, and productivity gains. High growth is based on assumptions of strong technological change brought about in the OECD countries by continuing research and development. The non-OECD countries advance by catch-up economic growth fostered by high investment, improved governance, efficiencies gained from expanded trade and financial linkages, and rising investment in human

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[16] See, in particular, National Intelligence Council (2004, 2008), United Nations (2004), and UNEP (2007).

capital. There is clearly much scope for catch-up growth in the non-OECD countries, but there is also no scientific way of forecasting how much convergence will be achieved or what growth-enhancing or growth-retarding policies will be followed in each country.

The assumptions used here produce another golden age of growth, with world growth and growth in most regions higher than in the last 25 years. With economic growth at this high pitch, world poverty shrinks dramatically. The number of extreme poor shrinks from 1377 million in 2005 (the Chen-Ravallion starting-point number) to 964 in 2015 and 245 in 2050 (Table 8). Strong economic growth leads to the eradication of extreme poverty in India, but not China. China's much more unequal distribution of income and consumption put that country at a disadvantage in eliminating poverty. Sub-Saharan Africa cuts its poverty rate substantially, but, assuming continuing high population growth rates,[17] the number of people living in extreme poverty continues to grow past 2015. A few countries in East and South Asia (Afghanistan, Bangladesh, Nepal, Pakistan, and Democratic People's Republic of Korea) and Haiti account for most of the rest of the people still living in extreme poverty in 2015. By 2050, assuming per capita income growth over 2 percent a year, the poverty headcount in sub-Saharan Africa has started to fall but it still nearly 200 million people. By 2050, in this high growth scenario, the global poverty rate is only 2.5 percent.

Table 8
Poverty Estimates in the Market First Scenario

	Average annual rate of growth, real GDP per capita	Poverty Headcount at $1.25 a day			Poverty Ratios		
		Constant within-country distributions					
	2006-50	2005	2015	2050	2005	2015	2050
World	3.0	1377	964	245	21.3%	13.3%	2.6%
OECD	2.8						
Non-OECD	3.8	1377	964	245	24.8%	15.3%	2.9%
East Asia, Pacific	4.3	316.2	125.5	15.6	16.8%	5.3%	0.7%
China	4.8	207	106.1	12.4	15.9%	7.6%	0.8%
South Asia	4.3	595.6	249.2	14.1	40.3%	15.4%	0.6%
India	3.9	456	243.2	0	42.0%	19.8%	0.0%
Sub-Saharan Africa	2.5	391	395	205	50.9%	41.1%	11.7%
Latin America	3.4	46	35	7.8	8.2%	5.6%	1.0%
Middle East/North Afric:	3.3	11.0	8.7	0.7	3.6%	2.2%	0.1%
Eastern Europe/former S	3.4	17.3	13.5	2.1	3.7%	3.8%	0.4%
World Gini		68.4	68.0	64.8			

Sources: Historical data from World Development Indicators (with estimates from Maddison (2003) for missing data).
Scenario data from simulations with the International Futures Model

The world Gini coefficient falls to 64.8 in 2050, but still remains high compared to most within-country distributions because economic growth is assumed to continue to be strong in the OECD and other rich countries. Continued high global inequality and high Gini coefficients within many countries are troublesome features even in this low-poverty scenario and may prevent it from happening. Alessina and Perotti (1993) found that income inequality hurts growth by increasing political instability and thereby decreasing investment. Henry Rowan (1995) believes that inequality heightens class conflict, produces capital flight, and encourages redistributive policies that can be self-defeating. Amy Chua (2004) believes that global inequalities provoke resentment of the poor toward the rich countries, inhibiting cooperation and trade at best, and provoking violence at worst.

Sub-Saharan Africa performs relatively poorly in the Market First scenario, but even there the poverty headcount eventually starts to decline. Economic growth in this scenario is not low by world historical standards and good by Africa standards—GDP per capita is projected to rise by 2.5 percent per year for the region. The average of country growth rates is similar, but the IFs projections show a wide range of country growth rates[18]—from -0.8 percent per year in Togo to 5.9 percent per year in the United Republic of

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[17] The population growth rates embedded in the IFs forecasts closely track the United Nations' mid-range population forecast.

[18] Mainly because of different assumptions about policy changes by country, and between-country historical differences in translating policy changes into economic growth.

Tanzania. These rates of growth are enough to bring the poverty rate down sharply in the region, but population growth is so high and the starting level of income is so low in most countries that it takes a GDP per capita growth rate of approximately 2 percent per year or more to bring the poverty headcount down. Cameroon, Democratic Republic of the Congo and Liberia are among the weakest performers, and 8 out of 38 countries projected show higher poverty headcounts in 2050 than in 2005. High projected economic growth in Ethiopia, Mozambique, Nigeria and the United Republic of Tanzania accounts for about 70 percent of the fall in the regional poverty headcount. South Africa nearly succeeds in eliminating extreme poverty not because of high economic growth but because it had such a low poverty headcount ratio in 2005 that it did not require much positive per capita economic growth to push almost all of the population above the poverty threshold.

The IFs model also produces estimates of food supply and demand, by country, consistent with its demographic and economic projections. World food demand in this high-economic, medium-population growth scenario increases by about 1.3 percent a year to 2050. World supply rises somewhat less because substantial improvements in technology and transportation infrastructure are assumed to cut crop losses sharply. Land devoted to crop production is assumed to rise only slightly while technological advances increase world average crop yields by about 0.9 percent per year (Table 9). Calories available per person rise everywhere and particularly so in sub-Saharan Africa. If alternative assumptions were made reducing technological advances that aid food production, the relative price of foodstuffs would increase, some countries would be advantaged and some disadvantaged but overall world economic growth would slow and poverty would increase.[19]

Table 9

World Food Supply and Demand in Market First Scenario

	World Crop Production million metric tons	Crop Land million hectares	Yield tons per hectare	Crop Loss Ratio percent
2005	4190	1544	2.71	30.3%
2050	6584	1617	4.07	22.3%
percent change	57.1%	4.7%	50.0%	
avg. ann. Pct. Change	1.0%	0.1%	0.9%	
Calories available per person				
	World	OECD	Non-OECD	Sub-Saharan Africa
2005	2,800	3,421	2,662	2,256
2050	3,207	3,635	3,135	2,588
percent change	14.5%	6.3%	17.8%	14.7%
avg. ann. Pct. Change	0.3%	0.1%	0.4%	0.3%
Percent of population malnourished				
	World	OECD	Non-OECD	Sub-Saharan Africa
2005	12.4%	1.9%	14.8%	30.7%
2050	4.5%	0.0%	5.3%	18.5%

Source: Market First scenario, International Futures Model

How might distribution shifts affect future poverty headcounts?

We have seen that economic growth is not the only factor that matters for changes in poverty levels; shifts in the amount of production made available for consumption (shifts in the Consumption/GDP ratio) and shifts in the distribution of consumption among a population (Lorenz curve shifts) also can have large impacts on poverty.

Lorenz curve shifts

Kuznets (1955) suggested that economic development itself made income distributions more unequal, by increasing returns to capital and leaving the rural poor lagging further behind workers in the modernizing

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[19] More interactions between growth, inequality, and food supply and demand could be generated for a second iteration of this paper.

sectors of the economy. Recent work by Ravallion (2001) and Dollar and Kray (2002) rebut the idea that growth has negative or any systematic effects at all on distribution. Barro (2000), however, suggests that income inequality does tend to rise until a per capita income of \$4,815 (in 2000 PPP dollars) and then starts to fall.[20]

Some researchers have attempted to forecast changes in within-country income distributions based on demographic shifts. Using data from the 1960s through the 1990s, Higgins and Williamson (2002) find a strong relationship between trends in income equality and demographic shifts: inequality decreases as the higher-earning middle-age cohorts grow in proportion to the rest of the population. They forecast very large decreases in within-country inequality over the next 50 years, with the weighted average African Gini coefficient falling from 46.4 in the 1990s to 37.8 in 2050, and the Latin American and Pacific Rim region experiencing similar proportionate declines. Higgins and Williamson also report estimated changes in the ratio of income of the highest to the lowest quintiles (Q5/Q1) for the three regions.

While the Higgins/Williamson regional income distribution estimates do not give a clear linkage to the country income and consumption distributions used in this paper, I used their forecast of the declines in Gini coefficient and Q5/Q1 ratios to generate forecasts of country distributions and then calculated the resulting headcounts to show the sensitivity of the poverty and Gini coeffecient numbers to the Higgins/Williamson forecast. The new country-distribution estimates used in this simulation captured the essence of the Higgins-Williamson estimates: the three regional Gini coefficients fell by the same ratio and the change in the Q5/Q1 ratios fell by the same amounts. The postulated change in within-country inequality, motivated by shifting demographics, reduces the global poverty headcount estimate in 2050 from 232 million people to 114 people.

Researchers at the World Bank (2007), however, have recently used other empirical work suggesting a conclusion opposite to the Higgins-Williamson work: as the shares of older workers rise in proportion to the total work force, inequality rises "since wage dispersion within these groups tends to be high":[21] The World Bank suggests an increase of about 4.0 in the African regional Gini coefficient by 2030, and an increase of 1.6 in the Asian Gini coefficient. I generated rough estimates of what the World Bank numbers would mean to the percentile distributions used in this paper; the inferred Q5/Q1 ratios rising in Asia and Africa, instead of falling as in the Higgins-Williamson case. The shifting within-country distribution pushes up the 2050 global poverty headcounts to 328 million people.

Thus the two conflicting views of the endogenous future of Lorenz curve shifts put a band of about a 100 million people on either side of our Market First scenario projected poverty headcount of 245 million in 2050. Of course policy measures—either explicit or unintentional— might also be undertaken by governments that shift the Lorenz curve in either direction.

Shifting Consumption/GDP ratios

Consumption to GDP ratios average about 56 percent in the OECD, and fluctuated around a narrow range, 1981-2005. The average consumption to GDP ratio for the non-OECD countries is similar, but much more variable. The numbers range from 14 to 171 percent of GDP using PPP data from the World Bank's World Development Indicators (WDI) database. Using implicit consumption figures from the household surveys as reported on the Povcal website and dividing by the GDP figures from WDI, the range is even greater, from 7 to 237 percent. Some very large ratios occur in war-torn countries where investment is probably very low and foreign aid is very high. Some very small ratios occur in countries with substantial mineral export wealth. It is also possible that some of the large and small numbers are due to data errors, either in the household surveys or in the National Income Accounts data, or both.

We know from the analysis shown in Table 5 that the poverty estimates were significantly affected by past shifts in the consumption-to-GDP ratios, particularly by the huge implicit decline in the Indian consumption figures. In a long-run scenario such as this with very high growth rates over time one could plausibly assume that the non-OECD consumption rates ought to converge and stabilize near the present OECD levels. Such an experiment was not conducted for this paper but it would probably not have had a great impact on the

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[20] This idea could be explored empirically in another iteration of this paper.
[21] Global Economic Prospects (2007, p. 85).

overall numbers—since the starting point for the non-OECD countries was not to dissimilar from the OECD— but it could dramatically affect those countries now far from the OECD average.

This analysis further suggests, however, that the conventional concept of pro-poor growth which looks at just the shift in income Lorenz curves and economic growth (see Kakwani (2000) and Chen and Ravallion (2001) is inadequate—shifts in the consumption ratio must also be considered and should not be treated as independent of either growth or the Lorenz curve. An increase in the consumption ratio, other things equal, reduces the poverty headcount. But if an increase in the ratio comes at the expense of productive investment, the long term effect could be anti-poor.

Our poverty measures rely on household consumption surveys that reflect changes in aggregate consumption figures with little correlation to changes in consumption and GDP figures in the National Income Accounts. This use of sometimes inconsistent data weakens an important analytical link between poverty and economic growth. For example, according to the National Income Accounts data (as converted into 2005 PPP data by the World Bank), India's real GDP per capita grew at an average annual rate of 3.8 percent, 1981-2005, and private consumption per capita grew at 2.9 percent per year. The Povcal database per capita consumption figures, based on the household survey data, grew at just 1.0 percent per year over this period. If Chen and Ravallion are correct in stating that the household surveys are a better measure of consumption than the National Income Accounts, one should probably conclude that the GDP growth estimates are not reliable. More detailed analysis is required illuminating the forces not just behind shifts in the Lorenz curve but also the connection between consumption measured by the household surveys and economic growth.

Setting aside these analytical problems, the numbers in the Market First scenario tell a good-news story. The extreme poverty headcount is shrinking in most regions by 2015 and in all regions by 2050. The original Millennium Development global poverty headcount ratio—15 percent by 2015—should be reached easily.[22] While I have focused on the numbers at the $1.25-a-day standard, the improvements at the more generous $2.50-a-day standard are even more impressive, from 3,085 million (48 percent of world population) in 2005 to 710 million (7.3 percent). Even in the pessimistic scenario in which demographic shifts lead to worsening within-country distributions (the World Bank scenario), the global poverty headcount still shrinks dramatically because of good economic growth.

The trouble with this good-news story, however, is that it is just a scenario; there is no way of knowing if world economic growth rates will be anywhere near this high or how within-country distributions will change. The growth rates assumed in the Market First scenario are, after all, almost everywhere higher than those that actually occurred in the post World War II "golden age" period of global growth when so much of the poverty rate reductions calculated by Bourguignon and Morrisson occurred.

Economic growth above 3 percent per year in real per capita terms in the non-OECD countries is certainly possible over the next 40 years. Most of the countries in this group are so far behind the OECD countries in productivity levels that they have enormous growth potential by adopting modern techniques and gradually converging toward OECD-level productivity. The long-term growth rates envisioned in the Market First scenario for Africa, Latin America, and the Middle East are actually quite close to the growth rates achieved in 2002-2007, coinciding with an unusually high period of world economic growth. But even assuming that war, resource constraints, or climate difficulties do not intrude, maintaining such high growth rates will involve enormous changes in governance, institutions, and attitudes in many countries.

Comparison to other long-range growth and poverty projections.

Nobel-Prize winning economist Robert Lucas (2000) has produced a similar scenario. He believes that the non-OECD countries will converge with the OECD countries over the course of this century, citing three major reasons:

- based on Tamura's work (1996) he assumes technology diffusion, the idea that knowledge produced anywhere benefits producers everywhere;

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[22] Chen and Ravallion (2008) suggest that since the original goal was a "halving of the extreme poverty ratio from 1990 to 2015" the upward revision of the historical numbers implies the new goal should be closer to 20% than 15%. That goal is also easily reached in the Market First scenario.

- from Prescott and Parente (1994) he expects improvements in governance ("governments in the unsuccessful economies can adopt the institutions and policies of the successful"); and
- diminishing returns and flows of resources ("high wages in the successful economies lead to capital flows to the unsuccessful economies, increasing their income levels").

Lucas' world growth model suggests that the long period of rising global income inequality that began with the industrial revolution in 1800, slowed down or ended in recent decades, and will reverse itself in this century: "I think the restoration of inter-society income equality will be one of the major economic events of the century to come."[23]

Henry Rowan (1996) predicted that within a generation most of the world's population will be rich or at least much closer to it than it is today. Not only will incomes converge across countries, he said, but also the world will become more peaceful and democratic. He did not deny the existence of enormous problems in every part of the non-OECD world, but he believed that better policies and growing social capabilities would spur growth:

> "A major reason why there are still poor countries is that their economic policies have produced unstable prices and employment, domestic prices out of line with world ones, inefficient nationalized and regulated industries, low trade shares, little foreign capital and technology, and obstacles for the creation of new industries. Such errors are now widely being corrected. Import-substitution policies are being replaced by export-oriented ones, countries hitherto hostile to foreign investment are encouraging it, regulations being reduced, firms privatized, and more (Rowan (2006), p 93)."

Angus Maddison (2007) also has produced a bullish long run economic forecast to 2030, although one with more diverse regional results than the Market First scenario. In his *Contours of the World Economy, 1-2030 AD*, he forecasts the non-OECD group of countries growing almost twice as fast as the OECD countries (3.0 to 1.7 percent) in real per capita terms, 2003-2030. He assumes technological advances will keep growth high in the mature economies and he expects convergence forces will allow China and India to both average about 4.5 percent growth in real terms. Growth will slow over the period as these countries approach the technological frontier and are forced to devote more resources to environmental and welfare issues. He assumes that Latin America will continue on a slow growth path due to outright rejection or half-hearted implementation of pro-growth policy reforms. He projects only 1 percent growth in Sub-Saharan Africa.

The global growth optimism in the Market First scenario is also replicated in the Intergovernmental Panel on Climate Change A1 global warming scenarios which envision very rapid economic growth—3.1 percent real world per capita GDP, 2001-2050—based on increased globalization and rapid introduction to new technology (IPCC, 2009).

The bullishness in all these scenarios comes from similar concepts about economic growth. The projections are based, implicitly or explicitly, on the extended neoclassical growth model described above and assumptions about the same factors that presumably are growth-promoting such as the institutional and policy factors that promote or discourage convergence. Economists at the World Bank and elsewhere are in general agreement on the nature of governance and institutions that work best to promote long-run economic growth:

- Free markets and private property are better at generating growth than centralized government control of production, but a strong government is nonetheless essential to force the rules of peaceful economic behavior and alleviate inevitable market failures.
- Trade and financial market liberalization is needed to spur competition and the flow of investment funds, including increased access to developed-country goods and capital markets.

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[23] The Lucas arguments and the exact quotes cited in this paragraph are from Lucas (2000), p 164-166.

- Democratic accountability of government is helpful, to keep both corruption and predation from destroying incentives to work, save, and invest, and to encourage pro-growth spending on education, health, and infrastructure.[24]

But despite wide—not universal—acceptance of these principles there is little agreement on how countries can or should transition to modernity and what outsiders can do to help. It took hundreds of years for Western Europe and North America to develop, from within, the institutions that propel the modern economy and the Washington Consensus ideas provide only general principles, not specific policy guidance. No well-meaning expert has the ability to design a fail-safe program to guarantee economic success even in countries with governments willing to reform. In addition, the application of policies aimed at converting these principles into practice under the guidance of the International Monetary Fund and the World Bank has lead to numerous policy failures, few successes, and much bitterness (Easterly, 2001). There is also some outright political opposition to many of the tenets of this market-oriented approach to economic governance and it is very easy for political leaders to resist or overthrow reform efforts for reasons of intellectual disagreement, ignorance, domestic politics, or personal (or group) advantage.[25]

The Market First scenario also assumes that the OECD countries continue to grow at high rates—high in per capita terms compared to historical norms. This is not implausible. The OECD countries, despite the severe recession of 2008-09, have economic and political institutions designed to generate good economic growth, and large expenditures for research and development are expanding the knowledge frontier in a way that could well lead to significant productivity gains for decades to come. Growth in the countries at the technological frontier depends mainly on human capital development and there is no physical limit on that.[26]

High OECD growth by itself probably hurts the global inequality numbers, but it is helpful to economic growth, and hence poverty reduction, in the non-OECD countries. The OECD countries, however, face their own set of problems, especially dealing with a rapidly aging population that threatens to undermine the social contract that underpins economic success. It is easy to imagine a scenario with much lower economic growth in both the OECD countries and the rest of the world.

THE TREND GROWTH SCENARIO

In an alternate scenario I calculate what would happen to global poverty if the benign assumptions that drove convergence of the non-OECD countries in the Market First scenario did not occur. Instead, most countries are assumed to continue on the same trajectory they have been on for the last 25 years. For some countries, notably China and India, that is a very good trajectory. But for Latin America, Africa, and the Middle East, recent economic history has not been favorable apart from a few years in the early 2000s when almost all countries participated in an unsustainable global boom (Table 10).

In Latin America, GDP per capita grew an average of only 0.7 percent per year, 1981-2005, while growth averaged 0.5 percent a year in the Middle East/North Africa region. In sub-Saharan Africa, GDP per capita declined an average of 0.2 percent per year, increasing the poverty headcount by nearly 180 million people.[27]

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[24] This list stems from the original "Washington Consensus" list proposed by Williamson (1989). For a more up-to-date discussion see the Commission on Growth and Developoment's *The Growth Report: Strategies for Sustained Growth and Inclusive Development* (2008) and Rodrik's "A Washington Consensus I Can Live With" (2008). See also Mancur Olson's "Big Bills Left on the Sidewalk" (1996) for a discussion of overcoming the collective action problem.

[25] The latter point is extensively treated in Acemoglu and Robinson's *Economic Origins of Democracy and Dictatorship* (2006).

[26] See Peter Schwartz (1999) or Duesterberg and London (2001) for optimistic discussions about the future of technology.

[27] There was a slight decrease in the Sub-Saharan African poverty headcount ratio which is surprising given the low GDP growth rates. The previous Chen-Ravallion estimate (2004) showed the Sub-Saharan poverty ratio increasing by 5.3 percentage points between 1981 and 2001. My 2008 estimate had the Sub-Saharan poverty ratio increasing 6.5 percentage points between 1980 and 2005.

Table 10
Poverty Headcounts and Poverty Ratios in the Slow-Growth Regions in 2050

	Average annual growth PPP GDP per capita 1981-2005	Poverty headcount (at $1.25 a day, millions of people		Poverty headcount ratio %	
		1981	2005	1981	2005
Latin America/Caribbean	0.7%	42	46.1	11.5	8.4
Middle East/North Afirca	0.5%	13.7	11.0	7.9	3.6
Sub-Saharan Africa	-0.2%	214	391	53.7	51.2
Non-OECD	1.9%	1896	1377	50.5	24.7
World	1.5%	1896	1377	42.0	21.3
		Poverty headcount (at $2.5 a day, millions of people			
		1981	2005		
Latin America/Caribbean		107	122	29.2	22.1
Middle East/North Afirca		67.6	87	39.0	28.4
Sub-Saharan Africa		322	614	81.0	80.5
Non-OECD		2732	3085	72.7	55.3
World		2732	3085	60.5	47.7

Source: Chen and Ravallion (2008), except GDP growth from World Bank World Development Indicators

The global food situation is only slightly worse in 2050 than it is in the Market First scenario and it still shows substantial improvement over 2005 (Table 11). In sub-Saharan Africa malnourishment rises only 3 percentage points compared to the Market First scenario but the African people are projected to spend a much higher proportion of their (lower) incomes to cover their food needs.

Table 11
World Food Supply and Demand in Trend Scenario

	World Crop Production million metric tons	Crop Land million hectares	Yield tons per hectare	Crop Loss Ratio percent
2005	4190	1544	2.71	30.3%
2050	6150	1620	3.80	24.1%
percent change	46.8%	4.9%	39.9%	
avg. ann. Pct. Change	0.9%	0.1%	0.7%	
Calories available per person				
	World	OECD	Non-OECD	Sub-Saharan Africa
2005	2,800	3,421	2,662	2,256
2050	3,099	3,648	3,013	2,507
percent change	10.7%	6.6%	13.2%	11.1%
avg. ann. Pct. Change	0.2%	0.1%	0.3%	0.2%
Percent of population malnourished				
	World	OECD	Non-OECD	Sub-Saharan Africa
2005	12.4%	1.9%	14.8%	30.7%
2050	5.9%	0.0%	6.8%	21.4%

Source: Author's simulation with International Futures Model

In the Trend Growth scenario the per capita growth rate in the non-OECD countries as a whole is about half a percentage point per year less than in the Market First scenario, but the growth assumptions are cut drastically in the countries where most of the poverty is—sub-Saharan Africa, North Africa, and a few Asian and Latin American states. As we saw, the Market First scenario assumes very large increases in economic growth in these countries compared to the past two decades.

What happens to global poverty if economic growth rates do not improve from levels recorded in 1981-2005? In some regions the trend growth assumptions do not do much to raise poverty, even at the $2.50-a-day definition, because there is not much extreme poverty to begin with in the region (i.e., Latin America, although some countries such as Haiti are badly hurt) or because the trend rates of economic growth are high (i.e., India and China). Sub-Saharan Africa, however, which was helped in the Market First scenario by some extremely favorable assumptions about policy changes—if not regime changes—is seriously hurt. By 2050, the extreme poverty rate is three times what it was estimated to be in the Market First scenario (Table 12).

Table 12
Poverty in the Slow-Growth Regions

	2005		2050--Market First Scenario		2050--Trend Growth Scenario	
millions of people consuming below the $1.25 and $2.50 poverty thresholds						
	$1.25	2.50	$1.25	$2.50	$1.25	$2.50
Latin America	46.1	122	7.8	21.1	56.9	147
Middle East/North Africa	11	86.7	0.7	2.5	9.4	48.1
Sub-Saharan Africa	391	614	205	533	930	1364
World	1377	3085	245	710	1120	1948
percent of population						
Latin America	8.4%	22.1%	1.0%	2.7%	7.4%	19.2%
Middle East/North Africa	3.6%	28.4%	0.1%	0.6%	1.7%	8.9%
Sub-Saharan Africa	51.2%	80.5%	11.7%	30.5%	53.1%	77.9%
World	21.3%	47.7%	2.6%	7.6%	12.0%	20.9%

Source: 2005 from Chen and Ravallion (2008), 2050 figures from author's calculations.

In the Trend Growth scenario, the trend toward global income equality is stalled. From a global Gini coefficient of 68.4 in 2005, the Market First scenario pushes it down to 64.8 in 2050. In the Trend Growth scenario, the global Gini coefficient barely shifts to 67.9 in 2050.

Absolute income gaps expand in both scenarios

The absolute income gaps between the OECD and the non-OECD do not shrink in either scenario. In the optimistic Market First scenario, income gaps rise from almost $30,000 per person in 2005 (in PPP dollars, 2005 price levels), to $98,000 in 2050, even though the per capita GDP growth rate in the non-OECD is almost a percentage point higher than the OECD average annual growth rate over the 45 years of the scenario. The ratio of OECD to non-OECD per capita income falls sharply, from 7.4 to 5.3, but the absolute gap more than triples.

However lamentable, a widening of the gap in absolute terms is almost inevitable unless the OECD countries stop growing. If the OECD failed to grow at all for the next 45 years (versus 2 percent or more in these scenarios), it would take the non-OECD 57 years at 3.6 percent a year growth (as in the Market First scenario) to catch up with the average OECD GDP per capita income figure of $34,359. Even if one thought this were a desirable result, it is likely that lower growth in the OECD would lead to lower growth in the rest of the world—it is hard to imagine the non-OECD countries growing robustly if the OECD countries are stagnant.

Simulations with the IFs model suggest that long-run Sub-Saharan African growth would fall between 40 and 140 percent as much as OECD growth falls, depending on assumptions about protectionism and technology. African economic growth in the IFs model is also quite sensitive to the level of foreign aid. Raising foreign aid contributions, gradually, to 0.75 percent of OECD GDP has no discernible impact on OECD growth, but it increases sub-Saharan African growth by almost 1 percentage point a year and reduces the sub-Saharan poverty headcount by 120 million by 2050. The model simulations implicitly assume that

most of the aid (an extra USD6.5 trillion over 45 years) is productively invested in physical and human capital.[28]

In all of these scenarios, extreme poverty becomes much more highly concentrated in sub-Saharan Africa because higher economic growth in Asia—particularly in India and China—removes hundreds of millions of people from the global poverty headcounts. Assuming 2 percent per year population growth, sub-Saharan Africa needs 2 percent per year per capita GDP growth (and constant within-country distributions) just to keep the extreme poverty headcount from rising. Faster growth—2.5 percent per year in the Market First scenario—cuts the headcount from 391 million in 2005 to 205 million in 2050, and higher growth rates are possible. In addition to raising GDP growth, however, lowering population growth or flattening within-country distributions could also help reduce the poverty headcount. If somehow, sub-Saharan Africa could cut its population growth in half but still manage GDP per capita growth of 2.5 percent a year, the 2050 poverty headcount would fall below 100 million people. If we combine the 2.5 percent GDP per capita growth rate with the low population growth rate, and with the Higgins-Williamson favorable distribution forecast, extreme poverty in sub-Saharan Africa would almost disappear.

Comparison to other long-range growth and poverty projections

One of the most famous pessimistic scenarios in the literature was created and periodically revised by Meadows and her associates in the *Limits to Growth* books (1972, 1992, and 2004). They claim that present trends in population, industrialization, pollution, and resource depletion will make current world economic growth rates unsustainable. They use a very different sort of model than the neoclassical growth model described above. The World3 model[29] is based on the idea that world systems, especially the agricultural system, has a finite carrying capacity that has been nearly reached. In their reference scenario global output per capita peaks around 2025 and goes into irreversible decline, mainly because of the collapse of world agriculture. Their model contains no country detail or poverty estimates, but it clearly portrays a much poorer planet than that envisioned even in the Trend Growth scenario. The major difference between the Limits to Growth scenarios and the more optimistic ones discussed in this paper is pessimism about the possibility of technological change to overcome perceived physical constraints.

Another line of thinking is represented by Immanuel Wallerstein (2004) and "World Systems Analysis". In this approach, instead of the world moving toward an improved and globalized capitalism as envisioned in the Market First scenario, the capitalist world-economy collapses due mainly to underconsumption and resentment of the peripheral countries toward the core. Unfortunately for our purposes Wallerstein presents no scenario of future developments after the collapse.

Ian Bremer (2009) does not predict the collapse of global capitalism but he does worry about a retreat from the market principles reflected in the Washington Consensus and a growing embrace of "state capitalism". He discusses the rise of state-owned energy companies, the renationalization of strategic industries in many non-OECD countries, and the growth of sovereign wealth funds.

> "The free-market tide has now receded. In its place has come state capitalism, a system
> in which the state functions as the leading economic actor and uses markets primarily
> for political gain (Bremer (2009), p 41)."

Bremer sees this development as anti-poor. By distorting incentives, creating vast new opportunities for corruption and rent-seeking state capitalism will inevitably slow growth and limit poverty reduction. State capitalism promotes protectionism and subsidies that will further restrict growth. Eichengreen and Irwin (2007) argue that, at best, there will be a long pause in trade policies of the United States of America geared toward liberalization and that "past gains from liberalization will get whittled away as countries backslide on previous commitments" (2007, p 25). A recent paper by Hillebrand (2009) using empirical estimates by Estavadeordal and Taylor (2008) estimates that a global retreat into protectionism (with tariff levels going back to pre-Uruguay round levels) might improve income inequality in a few countries, but it would cut

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[28] There is, of course, no guarantee that aid will be well spent. See Sachs, (2005), Easterly (2002), Collier (2007), and Moyo (2008) for differing views on the utility of foreign aid.
[29] The computer model is available from the publishers at www.chelseagreen.com

economic growth by almost a percentage point a year to 2035, and raise the global poverty headcount by at least 170 million people.

CONCLUSIONS

This paper has taken a long view of economic growth, poverty, and inequality—a view from 1820 to 2050. While acknowledging that the data are far from perfect and the methodology to fill in the gaps requires a substantial amount of guesswork, key contributions in the literature, especially Maddison (1995, 2001, 2003) and Bourguignon and Morrisson (2002), have established that world economic growth has been, on average, very high since 1820, high enough to cause global poverty to fall dramatically. More recent work, especially by Chen and Ravallion (2004, 2008), has shown that the downward trend in the global poverty rate accelerated after 1980 and even the poverty headcount has started to show a significant decline.

This paper has projected world poverty rates, headcounts, inequality measures, and absolute income gaps to 2050, based on two different scenarios for global economic growth. In the optimistic growth scenario the global poverty rate at the $1.25 a day standard falls sharply, from 21.3 percent in 2005 to 2.5 percent in 2050 and the number of people living in extreme poverty falls by 1.1 billion people. The absolute gap between per capita incomes in the OECD and the non-OECD countries, however, and the global Gini coefficient remain high.

In an alternate scenario, I assume that the regions that have been lagging (sub-Saharan Africa, the Near East, and Latin America) do not transition onto a high growth path. This results in much higher poverty levels: almost 900 million more people living in absolute poverty in 2050 than in the optimistic scenario. I have considered, but not explored empirically, even more depressing scenarios. Resource constraints, if not met by technological solutions, will surely make the poverty estimates shown here worse. A breakdown of the world capitalist system as envisioned by Wallerstein, or even a gradual turning away from the system that has done so much to reduce global poverty over the last two centuries would be disastrous.

TECHNICAL APPENDIX

This appendix discusses in greater detail several of the methodological issues raised in the text.

Purchasing Power Parity

We could compare GDP and incomes across countries at market exchange rates and for countries at similar standard of living and price levels and it would not be incorrect to do so. To compare GDP and living standards across countries at widely different levels of development, economists usually prefer to use purchasing power parity (PPP) ratios (between all currencies) which try to estimate how much of any given currency will be required to buy an equivalent amount of the same quantity and quality of goods in any country. The International Comparison Project (ICP) undertakes a massive international survey every few years to create new estimates of these PPP ratios at a given point in time. See the World Bank's *Global Purchasing Power Parities and Real Expenditures* (2008) for details.

To study incomes and living standards and poverty over time, the producers of the commonly used global economic databases (the World Bank (World Development Indicators database), Angus Maddison (2003), and the Penn World Tables (PWT)) start with PPP GDP estimates for every country at a point in time, and then estimate past and future PPP GDP based on national income account data. This methodology has severe theoretical drawbacks, especially the implicit assumption that the PPP ratio between currencies is constant. Efforts to replace this methodology have been considered by Dowrick and Akmal (2005) and Feenstra and Rao (2008) among others, but their ideas have not yet been adopted by the global database producers.

The Lorenz curve and Gini coefficients

The Lorenz curve is a widely used technique for showing inequality in income (or any other quantity distributed across a population). It shows the cumulative share of income held by cumulative shares of the population. If income is distributed evenly, then each 10 percent of the population gets 10 percent of the total income, and the curve is a straight line with a 45 percent slope. The more unequal the distribution, the greater is the bow in the curve to the right of the 45 percent line. The Gini coefficient is a summary statistic that measures the area between the 45 percent line and the Lorenz curve. Gini coefficients range in principle between 0 (perfect equality of income) and 100 (perfect inequality—one person in a population gets all the money). In practice, GDP per capita or consumption per capita Gini coefficients range from the mid 20s (some Scandinavian countries) into the 60s and 70s (some African countries).

Estimating and Forecasting Poverty Levels

Both the Chen-Ravallion methodology and the Bhalla SAP technique estimate Lorenz income distribution curves based on household survey data. Chen and Ravallion estimate poverty headcount ratio for a given poverty level directly from the Lorenz curve. The SAP procedure uses a regression technique to estimate the incomes of each percentile of the population of each country. If we know total consumption in a country (either from the household survey data as in the Chen-Ravallion work or from the national income accounts as in Bhalla), then we can estimate the consumption per person in each percentile of the population.

The SAP methodology leaves us with three discrete components of change in poverty headcounts: economic (GDP) growth, shifts in the share of GDP going to private consumption, and shifts in the distribution of consumption within a population.

The methodology used by Chen and Ravallion (2004) and by the World Bank (2006 and 2007) to estimate historical poverty levels is less convenient for forecasting because it uses a cross-country regression to posit a constant elasticity of poverty reduction to per capita income growth. The constant elasticity assumption is not very reliable for extending projections very far in the future given that we are interested in movements below or above a fixed poverty threshold. A country's incomes just below the threshold can cross the threshold with only a low level of growth while a country with incomes far below the threshold can have high rates of growth without moving many people out of extreme poverty (see Hillebrand (2008) for a fuller discussion).

REFERENCES

Abramowitz, M. 1956. Resource and output trends in the United States since 1870. *American Economic Review*. 46, 5-23.

Acemoglu, D. & Robinson, J. 2006. *Economic Origins of Dictatorship and Democracy*. Cambridge, UK, Cambridge University Press.

Alesina, A. & Perotti. 1993. Income distribution, political instability and investment. Cambridge, Massachusetts, USA: NBER Working Paper 3668.

Barro, R. & Sala-i-Martin, X. 1995. *Economic growth*. New York, USA. McGraw-Hill.

Barro, R. 1998. *Determinants of economic growth*. Boston, USA: MIT Press.

Barro, R. 2000. Inequality and growth in a panel of countries. *Journal of Economic Growth,* 5(1), 5-32.

Bhalla, S.S. 2002. *Imagine there's no country: Poverty, Inequality and Growth in the Era of Globalization.* Washington, DC: Institute for International Economics.

Bourguignon, E. & Morrisson, C. (2002) Inequality Among World Citizens: 1820-1992. *American Economic Review*, 92(4), 727-744.

Bremer, I. (2009). State Capitalism Comes of Age: The End of the Free Market? *Foreign   Affairs*, May/June 2009, 40-55

Chua, A. (2004). *World on Fire: How Exporting Free Market Democracy Breeds Ethnic   Hatred and Global Instability*. New York: Random House.

Dollar, D. & Kraay, A. (2002). Growth is Good for the Poor. *Journal of Economic Growth,* 7(195-225).

Dowrick, S. & Akmal, M. (2005). Contradictory Trends in Global Income Inequality: A Tale of Two Biases. *Review of Income and Wealth*, 51(2). 201-229

Duesterberg, T. & London, H. (eds.) (2001). *Riding the Next Wave: Why this Century Will Be a Golden Age for Workers, the Environment, and Developing Countries*. Fishers, IN: Hudson Institute Publications.

Chen, S. & Ravallion, M. (2003). Measuring Pro-Poor Growth, *Economic Letters* 78(2003) 03-99.

Chen, S. & Ravallion, M. (2004). How Have the World's Poorest Fared since the Early 1980s? Mimeo, World Bank Development Research Group, Washington, DC.

Chen, S. & Ravallion, M. (2008). The Developing World is Poorer Than We Thought, But No Less Successful in the Fight Against Poverty, World Bank Policy Research Paper 4703. Washington DC.

Collier, P. (2007). *The Bottom Billion: Why the Poorest Countries are Failing and What Can Be Done About It*. Oxford: Oxford University Press.

Commission on Growth and Development (Spence Commission) (2008). *The Growth Report: Strategies for Sustained Growth and Inclusive Development*. Washington, DC. World Bank

Easterly, W. (2001). *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics*. Cambridge, MA: MIT Press

Eichengreen, B. & Irwin, D. (2007). The Bush Legacy for America's International conomic Policy. http://www.econ.berkeley.edu/~eichengr/bush_legacy.pdf

Estavadeordal, A. & Taylor, A. (2008). Is the Washington Consensus Dead? Growth, Openness, and the Great Liberalization, 1970s-2000s. Cambridge, MA: NBER Working Paper, 14264.

Feenstra, R., & Rao, D.S. (2008). Consistent Comparisons of Real Incomes across Time and Space. Draft manuscript produced for PWT Workshop 2008, http://pwt.econ.upenn.edu/workshop2008/Time_Space_Real_Income_Comparisons_v3.pdf

Grossman, G. & Helpman, E (1991). *Innovation and Growth in the Global Economy*. Cambridge, MA. MIT Press.

Heston, A. (2008). The 2005 ICP Benchmark World Implications for PWT. Powerpoint presentation from Workshop 2008, Center for International Comparisons of Production, Income, and Prices. http://pwt.econ.upenn/edu/workshop2008/PennMay_bha.pdf

Hillebrand, E. (2008). The Global Distribution of Income in 2050. *World Development*,   36(5), 727-740.

Hillebrand, E. (2009). Deglobalization Scenarios: Who Wins? Who Loses? Paper presented at the 2009 convention of the International Studies Association, New York.

Higgins, M. & Williamson, J.G. (2002). Explaining Inequality in the World Round: Kuznets Curves, Cohort Size, and Openness. *Southeast Asian Studies,* 40(3), 269-288.

Hughes, B. & Hillebrand, E. (2006). Exploring and Shaping International Futures.Boulder CO: Paradigm Press

Kakwani, N. & Pernia, E. (2000). What is Pro-Poor Growth? *Asian Development Review*, 18(1) 1-16.

Kuznets, S. (1955). Economic Growth and Income Inequality. *American Economic Review*, 45(1), 93-106.

Lucas, R. (2000). Some Macroeconomics for the 21st Century. *Journal of Economic Perspectives,* 14(1), 159-168.

IPCC Data Distribution Center (2009), The SRES Emissions Scenarios. http://secad.ciesin.columbia.edu/ddc/sres.index.html

Maddison, A. (2001). *The World Economy: A Millennial Perspective*. Paris: OECD.

Maddison, A. (2003). *The World Economy: Historical Statistics*. Paris: OECD.

Maddison, A. (2007). *Contours of the World Economy, 1-2030*. Paris: OECD.

Meadows, D. (1972). *The Limits to Growth*. New York: Universe Books.

Meadows, D. & Randers, J. & Meadows, D. (1992). *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*. White River Junction, VT: The Chelsea Green Publishing Co.

Meadows, D. & Randers, J. & Meadows, D. (2004). *Limits to Growth: The Thirty Year Update.* White River Junction, VT: The Chelsea Green Publishing Co.

Milanovic, B. (2005). Worlds Apart: Measuring International and Global Inequalities. Princeton: Princeton University Press.

Milanovic, B. (2008). Even Higher Global Inequality than Previously Thought: A Note n Global Inequality Calculations using the 2005 International Comparison Program Results, *International Journal of Health Services*, (38)3, p 421-429.

Moyo, D. (2009). *Dead Aid*. New York: Farrar, Straus, Giroux.

National Intelligence Council (2004). *Mapping the Global Future*, NIC 2004-13 http://www.dni.gov/nic/NIC_2020_project.html

National Intelligence Council (2008). *Global Trends 2025: A World Transformed.* NIC 2008-003. http://www.nic.gov/nic/NIC_2025_project.html

Olson, M. (1996). Big Bills Left on the Sidewalk: Why Some Nations are Rich, and Others are Poor. *Journal of Economic Perspectives*, 10(2). 3-24.

Olson, M. (2000). *Power and Prosperity: Outgrowing Communist and Capitalist Dictatorships*. New York: Basic Books

Parente, S. & Prescott, E. (1994). Barriers to Technology Adoption and Development, *Journal of Political Economy*, 102(2), 298-321.

Pardee Center for International Futures (2009). *Reducing Global Poverty*. Boulder, CO: Paradigm Publishers.

Ravallion, M. (2001). Growth, Inequality and poverty: Looking Beyond Averages. *World Development*, 29(11) 1803-1815.

Rodrik, Dani (2008). A Washington Consensus I Can Live With. http://rodrik.typepad.com/dani_rodriks_weblog/2008/06/a-washington-consensus-i-can-live-with.html

Romer, P. (1987). Growth Based on Increasing Returns Due to Specialization. *American Economic Review,* 77(2), 55-62.

Romer, P. (1990). Endogenous Technological Change. *Journal of Political Economy*. 98(5), pt II, S71-S102.

Rowan, H. (1996). World Wealth Expanding: Why a Rich, Democratic, and (Perhaps) Peaceful Era is Ahead. Pages 93-125 In *The Mosaic of Economic Growth*, edited by R. Landau, T. Taylor, and G. Wright. Stanford: Stanford U. Press.

Sachs, J. (2005). *The End of Poverty*. New York: The Penguin Press.

Sala-i-Martin, X. (2002). The World Distribution of Income (estimated from individual country distributions). NBER Working Paper 8933, Cambridge, MA, May 2002.

Schwartz. P. (1999). The Long Boom: A Vision for the Coming Age of Prosperity. Reading, MA: Perseus Books.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*. 70(1). 65-94.

Tamura, R. (1996). From Decay to Growth: A Demographic Transition to Economic Growth. *Journal of Economic Dynamics and Control*, 20(6, 7) 1237-1264.

United Nations (2004). Global Environmental Outlook (GEO-4). http:///www.unep.org/geo4/media

Wallerstein, I. (2004). *World Systems Analysis, An Introduction*. Durham, NC: Duke University Press.

Williamson, J. (1989). What Washington Means by Policy Reform, in: Williamson, J (ed.): *Latin American Readjustment: How Much has Happened?* Washington, DC: Institute for International Economics 1989.

World Bank (2007). *Global Economic Prospects 2007: Managing the Next Wave of Globalization*. Washington, DC.

World Bank (2008). *Global Purchasing Power Parities and Real Expenditures: 2005 International Comparison Program*. Washington, DC.

World Bank (2009). *Global Economic Prospects 2009: Commodities at the Crossroads.* Washington, DC.