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Abstract

This paper uses a unique data set of the Human Development Index to describe long-run human development trends for 111 countries, from 1970 to 2005. The first part of the paper shows trends by region, period and index subcomponent. We find that 110 of the 111 countries show progress in their HDI levels over a 35-year period. HDI growth is fastest for low-HDI and middle-HDI countries in the pre-1990 period. The life-expectancy and education subcomponents grow faster than income. The assessment of HDI progress is sensitive to choice of measurement. The second part of the paper focuses on the differences between income and non-income determinants of human development. First, HDI growth converges, both absolutely and conditionally, when running HDI growth rates on initial levels of HD. Second, we find that the income and non-income components of HDI change have a near-zero correlation. Third, we look at determinants of the non-income components of the HDI. We find that income is not a significant determinant of HDI change once we include urbanization, fertility and female schooling. Fourth, we test the effects of institutions, geography and gender on HDI growth. We find that the most robust predictors of HDI growth are fertility and female schooling. We check this result using years of women's suffrage as an instrument for changes in gender relations, and find that it is a significant predictor of HDI progress for the whole sample.

Keywords: human development, education, health and demographic trends, cross-country comparisons, measurement and analysis of poverty

JEL Classification: O15, N30, O50, I32

INTRODUCTION[1]

The world has witnessed significant improvements in human well-being over the past decades. Since 1970, life expectancy increased by 9 years, average literacy increased by 20 points and income per capita increased by US $3,800.[2] While global improvements have been impressive, they have also been highly uneven. The differences in human development achievement *within* developing countries are similar to the differences *between* low and high income countries (Grimm et al. 2009; Grimm et al. 2008). This unevenness is a key characteristic of long-term development, but is also a matter of controversy in the literature. Is human development different from income as an indicator of well-being? Part of the discussion arises from what is being measured (e.g. income, child mortality), and part, from how best to measure changes over time and across countries (e.g. rate of change from start-point, performance relative to similar countries). This paper engages this discussion, by describing trends in human development—as measured by changes in the Human Development Index (HDI)—from 1970 to 2005. We present trends by region, period and sub-components of the HDI, and test a number of hypotheses to help explain the patterns of change observed over the past thirty-five years.

The paper uses a unique data set on the Human Development Index for 111 countries, in five-year intervals, from 1970 to 2005. The HDI, introduced in 1990, measures changes in leading a healthy and long life, acquiring knowledge, and attaining a decent standard of living. The index has spurred a large literature since its inception (Fukuda-Parr and Kumar 2003; Deneulin and Shahani 2009). It was conceived as an expanded measure of well-being, alternative to the economic growth measures popular in the development literature (ul Haq 2005). Despite its impact, the index has also attracted a substantial amount of criticism for its analytical and empirical underpinnings (see Srinivasan 1994; Raworth and Stewart 2002; Ranis, Stewart and Samman 2005). We focus our analysis on the relatively less known story of how *changes* in human development have produced present-day levels of human development achievement

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[1] The authors would like to thank Francisco Rodriguez, Frances Stewart, Gustav Ranis, Jose Pineda and Ricardo Fuentes for valuable comments to a draft version of this paper. All errors and omissions are our own.

[2] These estimates are global population-weighted averages that use the 111 country data-set assembled for this paper. See data section for more details on the expanded data set.

across the globe. We find that human development trends fit into a larger story of demographic change since the 1950s, driven by initial levels of human development and changes in fertility and female schooling. While our data constrain us to national averages, the patterns of HDI change are clear: human development contrast with economic growth in its convergence path and in the determinants of this convergence.

Describing internationally comparable indicators of human development poses a significant data challenge. Missing information, inter-temporal data comparability problems, and inter-country comparability problems, make the task of assembling trends especially difficult. A substantial part of the background research for this paper focused on issues of data assembly, validity and comparability. However, the analysis of trends yields three sets of findings which are the main focus of the paper: the first concerns the *rate* of HDI progress across countries, which shows that the poorest countries are achieving improvements in human development at a much quicker pace than the richest countries of the world. Over a thirty-five year period, only one country sees a reversal in its human development level while 22 countries see reversals in GDP per capita. We believe this to be a significant pattern which we examine using alternative measurements of change. We contrast these results with the fine-tuned convergence discussion of the economic growth literature. Surprisingly, the correlation between the income and non-income components of HDI change is close to zero. The second issue is *heterogeneity* in HDI trends, by region of the world, period of reference and sub-component of the index. A simple decomposition of the index into its subcomponents shows that sixty countries in our sample experienced improvements in HDI primarily by increases in life-expectancy, fifty-five by improvements in literacy, and five countries by improvements in income per capita. Achievements are faster for the pre-1990 period than for the post-1990 period, and are faster in Asia and the Middle East throughout the whole period. These results contrast with the conventional portrait of development progress, largely drawn from the economic growth literature. Third, we focus on *determinants* of human development change, and find that changes in gender roles (literacy, fertility and labor participation) are a robust driver of human development achievements over time, after controlling for a number of standard explanatory variables. We check this result correcting for endogeneity and using alternative model specifications. We use female suffrage as an instrument for changes in gender roles.

The paper is structured in four parts. Section 1 explores some of the key controversies in the literature on social and economic trends. Section 2 briefly discusses data issues, particularly the assembly of a series of comparable data from 1970 to 2005. Section 3 describes trends in human development and different ways of measuring performance. We describe trends by region, subcomponent and period. Section 4 analyzes determinants of convergence, tests alternative specifications and applies robustness checks to the analysis of both levels and changes in human development across countries. We conclude with some thoughts on how human development trends relate to broader demographic trends driving social and economic change.

1 THE LITERATURE ON TRENDS

The 1990 Human Development Report spurred a vast literature on alternative measures of well-being (see Fukuda-Parr and Kumar 2003). A number of analytical and methodological criteria guided the construction of the first index and set the stage for much of the praise and critique that followed. Mahbub ul Haq, the first coordinator of the report, singled out three features of the new index (ul Haq 1995). First, the HDI would measure indicators of well-being --other than income—"to enlarge people's choices" (p. 127). Inspired by Amartya Sen's *capabilities approach*, the index aims at expanding the measurement of well-being beyond the primacy of economic measures. Second, the new index was designed as a composite measure that would jointly cover both social and economic dimensions of well-being. In ul Haq's assessment, the contrived separation of dimensions of welfare, such as alternative GDP measures or the physical quality of life index (PQLI) "misses the synergy between social and economic progress" (p.128). While the inclusion of income in the HDI has attracted criticism, the joint analysis of economic and social progress, has been at the core of the HDI brand and has driven a holistic approach to policy analysis for two decades. The third feature of the index "was to keep the coverage and methodology of HDI (estimation) quite flexible" (p. 128). This has attracted a large literature that probes alternative measurements and specifications of a measure of multi-dimensional well-being. It has also left the door open for both expansions of redefinitions of the HDI in such expanded measures as the human poverty index (HPI-1 and HPI-2), and the gender related development index (GDI), among others.

Behind ul Haq's three features lies an enduring challenge to represent the *capabilities approach* in relatively simple, replicable and comparable cross-country and within-country measures of human development (Comim, Qizilbash and Alkire 2008; Alkire 2007). This has been a highly contentious issue in the literature and frames our evaluation of the HDI over time. In this section we consider three issues. The first has to do with what is being measured. What is gained and what is lost by unpacking the HDI by subcomponent or assessing the HDI in aggregate form over a thirty-five year time span? There is substantial disagreement over the limitations of the HDI with respect to income and other indicators of social progress. We review part of this discussion and set out some problems that can be tested empirically. The second issue has to do with how to model human development trends. Can we describe human development progress with the same underlying assumptions and specifications used for economic growth? We turn to a comparative assessment of the income and health literatures to help us formulate a modeling strategy. The third issue is whether what we describe for the 1970-2005 period is specific to this period, or is part of a longer underlying process of social and economic change. We turn to the literature on population and demography to provide some background on how this period fits into a longer time span of demographic change starting in the post-war period, and forecasting forward to 2050. We argue that the human development trends presented here should be assessed in this century-wide span.

The first issue relates to measurement. The human development index is made up of four indicators with different weights: literacy rates (22% weight), gross enrolment rates (11%), life expectancy rates (33%) and GDP per capita (33%). The index runs from 0 (low) to 1 (high human development), and thus standardizes comparisons across dimensions by constructing sub-indices. The degree of correlation between indicators has been a matter of discussion in the literature. Ranis, Stewart and Samman (2005) find that under-five child mortality has both a high correlation with HDI ranking (0.87), but also substitutes well for HDI when teasing out uncorrelated indicators for eleven dimensions of human development not included in the index. Wolfers (2009) finds, in contrast, that income per capita is highly correlated with HDI ranking (0.95) and claims that it adds little to alternative measures of well-being. In both cases, the comparison is on HDI *rankings* rather than the index itself which, as argued by Rodriguez (2009), might be useful for seeing who's up and who's down at one point in time, but is less

useful for evaluating what is driving change in well-being over time. Rodriguez finds that rates of change in HDI and GDP per capita, between 1990 and 2006, show a relatively low level of correlation (0.43) and that growth rate of the non-income portion of the HDI shows an even lower correlation (0.03) with the growth rate of income. Different issues would appear to be driving changes in education/life-expectancy and changes in income. This is one issue that can be further tested by contrasting the determinants of changes over time for the HDI and GDP per capita (we present this test in section 5).

A similar critique has been made of the correlation *between* the full set of indicators of the HDI (Srinivasan 1994). Srinivasan reports the overall correlation between indicators for the first three HDI indices (between 0.73 and 0.87), and finds that an equally weighted linear combination of the indicators accounts for 0.88 of the generalized variance among them. Given the high level of correlation, what is to be gained by aggregating them into a single index? Behrman and Rosenzweig (1994) add to this critique by emphasizing the weakness of the data for each of the subcomponents. They find, for example, that for 19 of 145 countries in 1994, there are no adult literacy figures since 1970, and that for 41 countries more, the latest data are from 1970-1979. Both critiques can be addressed with the new set of data (which we report in section 3). The most important question in both cases is whether there is something gained from unpacking the subcomponents, or running them together as a joint measure of well-being. We test both uses in this paper and find that each is useful for a different purpose –unpacking for discussing long-term trends, and aggregating when discussing convergence across countries over time.

The second issue relates to modeling social and economic trends over the long run. Charles Kenny (2005) shows evidence of long term convergence of education, health and infrastructure measures, using historical series from India, the United Kingdom, the United States and selected cases. Given the relatively sparse attention given to modeling the HDI trend itself (with the exceptions of Noorbakhsh (2007) and Craft (1997)), we focus here on two sets of literatures—on life-expectancy and GDP growth—to provide an analytical contrast over what is driving social and economic change over time. The GDP growth literature is extensive and provides a number of insights for evaluating long term change. The starting point for much of the recent discussion is Robert Barro's analysis of cross-country convergence over time (Barro and Sala-i-Martin 1992; Barro 1991). Barro finds evidence of "conditional convergence" between poorer and richer

countries over time, accounting for initial level of GDP per capita. Conditional convergence conveys the idea that poorer countries grow faster than richer countries, conditional on particular structural features of a country. The literature is divided on this issue. Pritchett (1997), for example, finds large divergence when comparing countries unweighted by population over time. Quah (1996), on the other hand, finds evidence of "club convergence" with weak convergence or divergence between structurally different countries. Bourguignon, Levin and Rosenblatt (2004) find that income converges conditionally across countries when weighting by population and diverges when data are unweighted. They argue that both measures are useful but imply different policy preferences.

In contract to the growth literature, the literature on progress in life expectancy and health outcomes tends to focus both on income and non-income determinants of long term change. Most international health comparisons focus specifically on determinants of child mortality rather that life-expectancy, because of comparability problems for countries with high rates of infant and child mortality rates and those without them (Deaton 2003 and Deaton 2006). Cutler, Deaton and Lleras-Muney (2005) review a large literature on the determinants of life expectancy and child mortality. They find that, although life-expectancy has increased by about 30 years in the past century, increases have been unequally distributed in the developed and developing world, with a gap of also 30 years between the richest and poorest countries. They argue that the key determinants to improved child mortality, after controlling for income, are related to science and technological progress, including changes in water and sanitation conditions, as well as the emergence of low-cost treatments for infectious and respiratory diseases in poorer countries. They highlight the importance of a health gradient to explain both the rate of progress, but also the unequal distribution of health progress over time. The idea of a gradient is that rich and poor adopt different health technologies at different speeds, thus leading to rising health averages, but also to growing gaps between the rich and poor until low-cost and easy-access technologies become available. Deaton (2003) pursues the linkages between health outcomes and income, beyond the technological adoption hypothesis. He finds that income does not explain health outcomes—for aggregate level analysis—but does explain individual level health outcomes. He hypothesizes that perhaps something else is at work in the incentive set that affects health behavior over time. In this view, income works through education, wealth, control, rank or other

more proximate causes of health status, rather than independently. In a more recent paper, Deaton (2006) suggests that "factors such as good governance and education, particularly women's education, are likely candidates for further investigation" (p.1). While acknowledging the importance of income and technology, Deaton emphasizes that it is the social factors that make effective delivery of health possible. In this paper, we test Deaton's hypothesis by focusing specifically on female schooling and fertility levels as determinants of child mortality trends. On the larger issue of modeling human development trends on economic convergence models or on its own terms, we test both in section 4.

The third issue concerns how recent trends fit into the larger picture of demographic change. The most recent United Nations revision of population projections sheds some light on how to frame the 1970-2005 period over the long run (UNDESA 2009). In the retrospective picture, two empirical issues are important. First, 1970-2005 is a period of explosive population growth. Global population increased by 2.9 billion people (from 3.6 billion in 1970 to 6.5 billion in 2005). Although the fastest rates of population growth were achieved in the mid-1960s, the highest level of year-to-year population growth was achieved in the mid 1980s. Population growth did not occur without significant consequences over other important features that affect human development over the long run, including rapid urbanization, increased domestic and international migration, and declines in fertility rates in both the developing and developed worlds. Although the pace of demographic transition was heterogeneous for different regions and countries throughout the half-century, declining fertility rates and declining mortality rates meant higher life-expectancy than in the past. According to the revised UN database, global life-expectancy rate increased from 58 to 66 years, since 1970, and from 46 years in 1950 (UNDESA 2009). The human development trends presented in this paper reflect a longer term trend of steeper improvements in life-expectancy since 1950. Second, there is a new demographic transition underway concerning ageing and the gradual rise of the economic dependency ratio: the (older) economically inactive population rises as a share of the (younger) economically active population (Gladstone 2010). The drop in the dependency ratio was deemed a demographic window of opportunity in the last half century (Bloom and Canning 2003; Bloom and Williamson 1998; Bloom and Friedman 1997), with multiple effects over proximate determinants of human development over time. Among these, links between rising female

schooling, drops in fertility rates and increased female labor participation are most important (Bloom et al. 2007). A large literature on structural transformation addressed this linkage in the 1960s and 1970s (Chenery 1960; Chenery and Syrquin 1975; Timmer and Akkus 2008). We revisit these hypotheses in Section 4 of the paper, which focuses on gender determinants of long term human development, controlling for demographic transition variables reviewed above.

A final issue of concern is whether human development trends are sensitive to changes in the HDI measure itself. As we take stock of historical trends in well-being, it is useful to think of a counter-factual measure that broadens the HDI beyond income, education and life-expectancy. Would trends change much if we added, say political or environmental dimensions, to the traditional HDI? Recent research suggests the answer is yes and no, depending on the variables and weights considered. First, there is the remarkable homogeneity in the non-income component of the HDI (mostly increasing over time) which contrasts to the relatively heterogeneous pattern of the income component (increasing, accelerating, stagnating, declining and collapsing). Changes to the HDI that affect or qualify economic growth –such as environmental sustainability— are likely to amplify the income-component heterogeneity; changes that affect social development –such as multi-dimensional poverty measures—are likely to affect the overall non-income trend only marginally. Second, existing research on multi-dimensional poverty measures suggests that the underlying pattern of alternative measures for political capabilities, such as "the ability to go about without shame" is likely to be very different from, say, the "political freedoms" indices gathered by Freedom House (Zavaleta 2007; Alkire 2009). Some measures of political capabilities are contingent to time and place; others are less affected by changes across countries and across time periods (Whitehead and Gray Molina 2003). Third, is the question of heuristic usefulness. While a multi-variable index that captures ever-expanding dimensions of well-being is more feasible now than it was fifty years ago, there is the question of descriptive and explanatory leverage. How much is gained by adding additional variables, weights and dimensions to the classical formulation of the HDI? The strength –and presumed weakness—of the HDI is its normative and empirical simplicity. The indicators that make up the HDI are standardized, relatively easy to gather and widely understood across the world. HDI levels, and changes in levels, are easy to grasp and provide a template for long run policy action.

2 THE DATA

Official trend data for the Human Development Index (HDI) begins in 1980 and only 82 countries have data that spans the entire sample. Our dataset is constructed to expand HDI data across both years and countries. It draws from several data sources to create trend data for HDI and its four components: GDP per capita, literacy, gross enrolment ratio, and life expectancy. The data set spans from 1970 to 2005 in 5-year intervals for 111 countries with data in all periods (see annex for details).

3 TAKING STOCK: THE HDI AND HUMAN DEVELOPMENT TRENDS

The first part of this section discusses what the HDI as a measurement tool can convey about how human development has been changing over time. The second part of this section presents a detailed descriptive analysis of HDI trends. After presenting four ways of examining HDI performance in section 3.1.1, we analyze changes in HDI by region and five-year intervals, compare the countries with the fastest and slowest growth, and consider the population sizes of high and low performers.

A diverse set of stories emerges that vary both within and between regions and across the 35-years of our sample. We find evidence that the HDIs of developed and developing countries are converging as the poorest countries tend to have the fastest growth, but we qualify our results with the fact that there may be elements of HD improvement that the HDI cannot capture.

3.1 Measurement

In this section we focus on two questions of measurement: (1) What is the most appropriate way to evaluate how countries perform compared to one another, and (2) does the HDI tell us anything more than simply looking at income?

3.1.1 Measuring Performance

One of the limitations of the HDI is that the HDI itself and several of its components are bounded. That is, while one can conceive of income as being virtually unbounded as

technological advances allow the wealthy to enjoy increasingly comfortable lives at lower costs, literacy and gross enrolment rates cannot exceed 1 by construction. Life expectancy may also have a natural bound. While healthy people in developed countries increasingly live past the age of 80, to live to 100-years-old remains a relatively uncommon feat. Thus, evidence suggesting that poor and rich countries are converging in terms of HD may simply be a consequence of the fact that rich countries have reached an upper bound of a particular dimension.

Nonetheless, suppose that rich countries have achieved life expectancies of 75 and make no more advances in health. If poor countries then have positive growth and are on track to achieve a similar level of life expectancy, one could still call this 'convergence', as all countries come to reach a common level of life expectancy. However, many rich countries that have achieved high life expectancies continue to make improvements in health. Thus, while developed countries may no longer see increases in life expectancy, they might instead increase years of healthy living. Such an improvement would not be captured in a simple measure of life expectancy. Similarly, countries that already achieve at or near the maximum of literacy and enrolment might continue to improve in quality-adjusted years of schooling. If this is the case, an analysis of the HDI and its components might suggest a convergence in health or education while developed countries may actually be maintaining or expanding the achievement gap.

While we acknowledge that the rudimentary nature of the HDI presents limitations as to what we can learn about global HD trends, the discussion above does not address the normative issue of valuing different types of HD improvements. More specifically, basic improvements in a particular HD dimension may be more important and valued more highly than advanced improvements. That is, an individual might realize a greater improvement in well-being by going from illiterate to literate status, than from literate to well-read.

There is value in knowing whether poor and rich countries are indeed converging according to the simple measures of the HDI. We present four methods to analyze this convergence, which are summarized in Table 1. Method (1) is the simple difference between the starting and ending values for a particular country. This measure indicates at the most basic level how much a country has progressed and allows us to compare the absolute magnitude of changes between countries. Method (2) is another commonly used way of looking at how a particular measure has

changed: the growth rate. This measure is simply the percentage change between the beginning and end of the period. The advantage of this measure is that it rewards relative HD performance. For example, a country that doubles its literacy from 10% to 20% has a higher growth rate than a country that increases its literacy from 80% to 90%. However, this measure does not capture the additional effort that might be necessary to increase HDI at higher levels. That is, increasing literacy from 80% to 90% might be more difficult than increasing from 10% to 20% because once a population has a literacy rate in the upper range, the remaining illiterate elements of the population may be those that are most difficult to reach.

We attempt to capture this possibility with measures (3) and (4). Measure (3) is the average annual growth rate of the 'unbounded log-transformation', which is a calculation commonly used in the analysis of probabilities like the logit regression. By construction, this measure is unbounded both above and below. Thus, it gives additional weight to initial values that are either near the top or bottom of the index. While we could apply this method to the income index, it is not necessary to do so because we use the log-transformation as a solution to naturally bounded variables. Measure (4) calculates a 'typical' level of growth given a particular initial level and then compares a country's actual performance to what might be expected. To do this, we run a bivariate regression of the average annual growth rate (measure (2)) on the initial level. We then calculate the fitted values of this regression, which indicate an 'expected' growth rate given a particular initial level. Measure (4) is the residual, that is, the difference between the actual and fitted growth rates.

Each of these measures provides different ways of looking at how the HDI has changed over time. In section 3.2.2, we present a detailed examination of what these different approaches reveal in the data.

3.1.2 Do HDI and Income Measure the Same Thing?

Some detractors of the HDI claim the index simply follows income and any examination of the HDI yields the same results as, say, GDP per capita. While the entire 1996 Human Development Report seeks to dispel this claim, this criticism persists (Wolfers 2009). Our dataset allows us to examine this question for a larger sample than past efforts, and we find further evidence that

refutes the assertion that HDI and income are interchangeable. Instead, we see that the non-income components of HDI provide valuable insights in understanding how HD has changed over time that a look at income alone would not reveal.

The first panel of Figure 1 shows what critics often point out in demonstrating how closely HDI and income are related. This figure shows HDI and income index levels in 2005, which do in fact have a 95% correlation. Panel B plots the income index against the average of the education and health indexes and shows that the relationship begins to weaken. While still high, these two variables have only an 88% correlation. However, in panel C the relationship nearly breaks down altogether. This graph shows the absolute difference from 1970 to 2005 for HDI and the income index. While the fitted line is still upward sloping, there is substantial variation among the 111 countries in the sample. The positive relationship disappears in Panel D, which shows the annual growth rate of the average of the non-income components. In this graph, the non-income components tend to have a negative relationship with income growth. While we do not claim that the relationship between the income and non-income components is inherently a negative one, these figures clearly illustrate that advances in certain HD dimensions do not necessarily translate into advances in others.

A regional analysis of HDI and income further suggests that the dynamics between the income and non-income components vary both by place and time. Figure 2 shows a scatter plot of HDI and the income index by year and region from 1970 to 2005.[3] A diagonal line segment indicates that HDI and income have moved together between two periods.[4] For the world as a whole and for many regions—including developed countries and China—HDI and GDP tend to increase together. However, there are several notable exceptions. Africa has had several instances of falling income, but HDI continued to rise in each of these periods. Similarly, a fall in income in

[3] Note that in most places in this paper when we refer to 'Europe' as a region, we are typically referring to developing European countries (mostly eastern European) and not all of Europe. Most of Western Europe is categorized in the 'very high' HDI or 'developed' country group.
[4] To enhance readability, we omit Oceania from these figures. Moreover, the Oceania regional average is based on only three developing nations with HDI data and may not be representative of the entire region. Due to its large population, China and India have been graphed separately. Developed nations have also been graphed as a separate group and are excluded from the other regional averages. Thus, the trend for Europe consists primarily of Eastern European countries.

Latin America and the Caribbean (LAC) in the 1980s was not reflected in the HDI. Figure 3 shows the same plot with the education and income indexes. Here we see that the education index doubled from 1970 to 2005 for Africa, while income growth remained stagnant. In LAC, the income index increased by 0.09 points (14%) from 0.65 to 0.74. On the other hand, the education index increased by 0.22 points (33%) from 0.66 to 0.88. In developing European countries, erratic income growth and decline was accompanied by a steady increase in education. A similar pattern unfolds with life expectancy in Figure 4. Despite a noticeable slowdown that occurs during the 1990s with the onset of the AIDS pandemic, Africa has an increase in life expectancy in every period. Developing Europe's volatile income coincides with a relatively unchanging health index, which actually decreased 0.01 points over the period.

The data indicate that while a snapshot of HDI and its components can suggest that they are highly correlated, an examination of their growth rates shows that they do not necessarily move together over time. Thus, the HDI as a composite measure of three broad HD dimensions provides information that is not apparent in measures of income alone. If one seeks to understand the drivers of HD, an income-only analysis will not provide a complete picture of how a population's well-being is evolving over time.

3.2 Examining Trends in HDI and its Components

In this section we present human development trends. In 3.2.1 we summarize population-weighted regional HDI trends, while showing China and India separately since they tend to dominate regional averages. In Section 3.2.3, we discuss population-unweighted averages using the standard regional classifications as established by the Human Development Report Office.

3.2.1 An Overview: Trends and Summary Statistics

As Table 2 shows, over the 35 years of our sample only one country (Zambia) ended with an HDI in 2005 that was lower than in 1970, despite 15 countries experiencing a fall in HDI in the 1990-1995 period. No countries had a fall in literacy, but 22 (14%) fell in GDP per capita over the period. More countries had a decrease in income between 1980 and 1985 than in any other period. The biggest fall in life expectancy occurred among 26 countries between 1990 and 1995. Relatively few countries had a fall in literacy during any period, but during the 1980s a quarter of

countries had falling enrolment rates. Overall, the vast majority of countries experienced increases in each dimension and period.

The average (population-unweighted) global HDI increased from 0.58 in 1970 to 0.73 in 2005 (27%), as shown in Table 3. However, there is a notable difference between each HDI group.[5] After 35 years, each group only begins to approach the level at which the next highest group began. For example, developed countries began the period with an average HDI of 0.80. In 2005 High HDI countries only barely surpass this level at 0.83. Similarly, Low HDI countries in 2005 are still below where Medium HDI countries began in 1970. This pattern is most pronounced in the income dimension where Low HDI countries actually experienced a 7% drop. Medium and High HDI countries had a nearly 20% increase of the income index and developed countries a 16% increase. This trend is in contrast to the other dimensions where Low HDI countries improved their education index by nearly 130% and their health index by over 50%. As we discuss in more detail below, poorer countries appeared to grow faster than rich countries in the health and education dimensions.

Figure 5 shows how population-weighted regional average HDI and its components have moved since 1970.[6] The most consistent pattern is that developed countries have had steady upward growth in all dimensions throughout the period. Developing European countries (which are primarily eastern European countries) nearly match the growth and levels of developed countries in the education index, but life expectancy has remained mostly level since the beginning of the period and in 2005 is below that of China and LAC. After faltering in the early 1990s with the fall of the Soviet Union, GDP growth has resumed a positive trend.

LAC has the second highest levels of HDI among developing regions. While the region has had only modest income growth, life expectancy and education have increased steadily. African life expectancy was increasing from 1970 to 1990, but growth slowed as AIDS began to take its toll in the region. And while income growth remained low, education has grown quickly and has

[5] HDI groups are categorized according to their official 2007 HDI as published by the HDRO in the 2009 HDR. That is, the group of countries that comprise 'Very high HDI' countries in 1970 is the same as in 2005.
[6] Figure 4 and Figure 5 depict developed countries, China, and India separately.

nearly reached the same level as Asia (excluding China and India) in 2005. Developing Asian countries (excluding China) began at roughly the same level of HDI as Africa in 1970 but have risen slightly higher since. While Africa has closed the gap in education, Asia has grown faster in both the health and income dimensions. China's rapid rise in income is well-known and apparent in Figure 4. After beginning with an income index below that of Africa in 1970, it has now surpassed both Africa and Asia and is on pace to reach similar levels as LAC and Europe. While China's income growth has been most striking, the country has also had significant growth in the other two dimensions. The education index is nearly at the same level as Europe and developed countries, and the health index is about even with that of LAC and is second only to developed countries.

Figure 6 illustrates how developing regions are performing relative to developed countries. The graphs show the ratio of the indexes of the indicated developing regions to developed countries.[7] One notable result of this figure is that all regions appear to be closing the education gap, although Africa and Asia still lag far behind China, Europe, and LAC. India has seen acceleration in closing the education gap since around 1995. The life expectancy gap in Europe has been progressively widening, but income is improving since falling behind in the 1990s. The African income gap has been increasing until about 2000 when it began to level. Again, AIDS caused reductions in life expectancy after 1990.

3.2.2 Convergence

In this section, we examine each measure of growth discussed in 3.1.1 to see if we reach different conclusions depending on how we define performance. Since we want to focus on how boundedness can affect our conclusions, we discuss the HDI components in terms of their actual data rather than as indexes.

[7] For example, a value of 1 indicates that a region has the same value in a particular index as that of developed countries. A value of 0.5 indicates the index is half that of developed countries.

In Figures 7 to 11, we plot the initial levels of HDI and its components against each of the four growth measures by region.[8] The first panel shows the simple difference in levels between 2005 and 1970. The second panel shows the average annual growth rate from 1970 to 2005. The third panel shows the log transform. And the fourth panel shows the deviation from the fitted line of a bivariate regression of annual growth on initial levels.

At first glance, the first two panels of Figure 7 seem to indicate that methods (1) and (2) yield a pattern of convergence. However, method (3)—the log transformation—is upward sloping and appears to show divergence. That is, countries with lower (higher) initial levels of HDI have lower (higher) growth rates over the 35-year period. Method (4) is flat. Finding divergence in the third panel is an unexpected result, so we look further at the sub-components to see what might be driving this outcome.

We do not calculate a log transform for GDP, but Figure 8 does show that income shows little sign of convergence in the other three measures. While method (1) appears to be an inappropriate measure of income convergence due to the large variability among countries, methods (2) and (4) indicate that a country's initial income level in 1970 had little bearing on its growth rates over the next 35 years. On the other hand, literacy, life expectancy, and gross enrolment each show strong convergence in the first two panels. In Figure 11, it is evident that Africa's low life expectancy growth is reducing the slope of the trend line for the whole, so we include a second trend line that excludes Africa. Omitting Africa from the sample yields a more robust health convergence for the other regions in each of the four measures. These results suggest that the divergence depicted in panel 3 of Figure 7 is likely attributable to the lack of convergence in income. Many rich countries are among the fastest growers of income. Their fast growth is magnified by the log transform calculation and disproportionately affects the trend line.

By our measures, we conclude that there has been convergence in the non-income components of the HDI from 1970 to 2005. In Section 5 we discuss several potential drivers of this convergence. But first we provide a more detailed descriptive analysis of HDI trends. For

[8] As discussed above, we do not calculate a log transform for GDP per capita.

brevity, the rest of this section uses method (2) (percentage change) to discuss these changes, unless noted otherwise.

3.2.3 HD by Region and 5-year Periods

Figure 12 and Figure 13 show the percentage change over 5-year intervals for the HDI and sub-components by region and HDI group.[9] One of the most noticeable patterns in these figures is that income growth fluctuates much more widely than the other components. While not as erratic as income, enrolment rates also tend to be more volatile than literacy or life expectancy. This result is unsurprising as both economic conditions and whether or not children attend school can change quickly—even daily. Literacy and life expectancy tend to be more slow-moving. While a recession can ensue and a family suddenly becomes unable to afford to send its children to school, a person, once literate, typically does not become illiterate. Likewise, a healthy population can reflect climate, culture, and public investment in preventive care, all of which tend to change slowly and/or have lasting effects.

Interestingly, enrolment growth rates fall for Africa, Asia, and LAC in the 1980s and rise again in the 1990s. In the wealthier regions—Europe, LAC, Northern America, and Oceania—life expectancy and literacy growth rates stay below 4% and are largely flat throughout the period. In Africa, life expectancy grows nearly 5% in the 1970-1975 and 1975-1980 periods. However, it drops to 0.6% in the 1990s.

Figure 13 illustrates growth rates by HDI quartiles in 1970. While there are several similarities to the regional analysis, the most prominent difference is the sustained fall in income growth from 1975 to 1995 among the second quartile. The top three quartiles experienced an increase in enrolment growth rates in the 1990s. The increase was only slight for the top two but drastic for quartile 3. For quartile 3, this increase is only after 20 years of sustained negative growth. Life

[9] The year indicted on the x-axis is the last year of the five-year period. That is, the leftmost (first) point of each line is the percent change of the respective index from 1970 to 1975. Note also that these figures reflect simple averages of the countries in category and are not weighted by population.

expectancy and literacy growth tended to be low and declining for each group except for Low HDI countries, which had high, sustained literacy growth despite dismal economic conditions.

Table 4 shows which HDI component had the highest growth rate by country from 1970-2005 grouped by region and 2007 HDI group. There is substantial variation among the regions. For 33 of the 35 African countries in our data set, the education index grew faster than the income and health indexes. In LAC, the health index dominated for 13 of the 21 countries, and education led for 6. Education outgrew the other indexes in half of all Asian countries, but health grew fastest for nearly a third of countries. Only in Europe did the income index lead HDI growth.

The health index led HDI growth in about half of developed countries with the remaining countries roughly split between education and income. Of the 59 medium and low HDI countries, income growth led in only 4. Education led in 42. Health led in 13 medium HDI countries and no low HDI countries.

3.2.4 Top and Bottom Performers

Table 5 shows the top and bottom performers by index and uses two performance measures: percent change; and deviation-from-fit. In some cases, these measures tell similar stories, but in others they yield quite different results, particularly among the bottom performers. For example, the results are nearly identical for life expectancy in terms of the countries in the top/bottom ten: among the top, percent change has Guinea at 10 and deviation-from-fit has Libya at 8; among the bottom, percentage change has the former Soviet Union (FSU) at 169 and deviation-from-fit has Congo (DR) at 165. A similar result is true of income.[10] On the other hand, the education components differ significantly, particularly among the bottom performers. The two measures have a completely different set of countries for the bottom ten literacy performers and have only 4 countries in common among the bottom 10 enrolment countries.

This result provides an interesting look at how these two measures demonstrate the performance of different countries. While percentage change simply assesses a country's proportional

[10] Among the top, method (2) has Thailand at 10 and method (4) has Macao at 10; among the bottom, method (2) has Kuwait at 151and method (4) has Nicaragua at 146.

improvement relative to its initial level, deviation-from-fit compares each country to other countries that began at a similar position. Deviation-from-fit also yields favorable results for the High and Very High HDI countries that fall among the bottom ten for literacy by percentage change. Instead, the deviation-from-fit method results in many of the poorest countries showing the greatest under-performance. Regardless of measurement, there are many differences in the top/bottom performers when comparing across the HDI and its subcomponents. The top life expectancy performers fall into three, rough geographic clusters: Bhutan, Nepal, and Bangladesh are in southern Asia, between India and the Himalayas; Yemen, Oman, Western Sahara, and Libya are predominantly Arab north Africa/Middle Eastern countries; and Viet Nam, Indonesia, and Timor-Leste are in Southeast Asia. The bottom ten are all sub-Saharan African countries, many of which have for years struggled with AIDS and/or violent conflict.

An interesting group of countries comprise the top gross enrolments rate performers, namely, Australia, New Zealand, and Denmark. These countries had high enrolment rates even among the wealthiest countries in 1970, ranging from 0.71 to 0.75 and ranking second, third, and ninth, respectively. By 2005 they had the first, second, and fourth highest enrolments rates of all countries with enrolment rates exceeding 1. Nepal and Bhutan also make this list along with Viet Nam's neighbor, Cambodia. The remaining four countries are the sub-Saharan countries of Liberia, Ethiopia, Burkina Faso, and Mali. As with life expectancy, the bottom ten performers are all sub-Saharan African countries. This is a surprising result since—as Figure 12 shows and section 3.2.3 discusses—Africa on average had higher enrolment growth rates than any other region. Indeed, the bottom performers according to method (2) show half as many African countries. However, the regional discussion above included North African countries in the Africa average. These countries—along with the four sub-Saharan countries in the top group—may be driving the regional average. By method (2), six of the top ten are sub-Saharan countries.

The top literacy performers are also dominated by sub-Saharan countries, which comprise seven of the top ten. The other three are Yemen and Oman—neighbors on the Arabian peninsula—and Nepal, which makes the top ten list for every index except income by both method (2) and (4). The bottom ten is a diverse mix of countries including the island nation of Comoros (between Mozambique and Madagascar), Iraq, two LAC countries (Nicaragua and Belize), three

south/southeast Asian countries (Bangladesh, Cambodia, and Papua New Guinea), and three African countries (Zambia, Mozambique, and Mauritania).

The top income performers include six small island nations or city-states (Singapore, Maldives, Hong Kong, Saint Kitts and Nevis, Malta, and Macao[11]). The top four of this group are Equatorial Guinea, China, Botswana, and the Republic of Korea. While the income growth stories of China and Korea are well-known, the high income growth rates of Equatorial Guinea and Botswana are not. Equatorial Guinea, which topped the list, can attribute most of its growth to the discovery of oil in 1996. The country increased its GDP per capita more than ten-fold over 20 years from $2,310 in 1995 to $24,770 in 2005. On the other hand, Botswana has had consistently high growth since independence in 1966, strengthened by a diamond boom since the early 1980s. While still poor by many standards, Botswana has remained largely peaceful, relatively well-governed, and has outgrown many of its neighbors over the last half century.

The fifth column of Table 5 shows the top and bottom performers in non-income HDI. While Nigeria does not make the top ten for life expectancy, enrolment, or literacy, it does fall in tenth place by percentage growth of the non-income HDI. The same is true of Benin and Algeria when measuring by deviation-from-fit. The remaining top countries by both measures are mostly sub-Saharan. Several Eastern European countries including Romania, Poland, Hungary, and the FSU that were at the bottom of literacy by percentage growth in addition to Bulgaria constitute half of the lower performers of non-income HDI. The other five are Tonga, Trinidad and Tobago, Zambia, Zimbabwe, and—unexpectedly—Denmark (although Denmark's high literacy from the beginning of the period likely drives this result). Nearly the same group of sub-Saharan African countries that fall at the bottom of life expectancy growth by deviation-from-fit are at the bottom of the non-income list. The only exception is Cameroon, which replaced Uganda among the bottom ten.

China and the Republic of Korea are the only two countries to appear both among the top ten income and HDI performers. However, six (sub-Saharan) countries overlap among the bottom performers: Liberia, Niger, Côte d'Ivoire, Central African Republic, the DR Congo, and Zambia.

[11] Hong Kong and Macao are specially administered regions of China.

A longstanding issue in the literature is whether economic growth precedes, happens simultaneously, or follows social achievements. Ranis and Stewart (2007) look at HD and the rate of economic growth in terms of virtuous and vicious cycles over a forty year period (1960-2001). A 'virtuous' cycle is one where high economic growth reinforces high HDI or high HDI reinforces economic growth. 'Vicious' cycles are the opposite. Ranis and Stewart (2007) find that HDI and economic growth are reinforcing, but that there are very few cases of virtuous growth. The few examples include Korea and Singapore over the entire 40-year period, and China, Malaysia, Viet Nam and Chile over shorter spans. The few instances of virtuous cycles provide some explanation why there is little overlap among the top education/health performers and the top income performers. Similarly, the prevalence of vicious cycles can explain why a similar group of countries makes up the bottom performers in both income and HDI.

3.2.5 Considering Population

In the previous two sections, we consider countries as equal units without taking into consideration their size. When we include population, we see that a small handful of countries tend to dominate the picture. As Figure 14 shows, developed countries comprise 15% of global population and the FSU, 4%. This portion is roughly equivalent to China, which is itself a fifth of the global population. India is slightly larger than all developed countries combined at 17%. The next five biggest countries—Indonesia, Brazil, Pakistan, Bangladesh, and Nigeria—comprise an additional 13%. The remaining 31% of the world's people are in one of 138 other developing countries, mostly in Africa and Asia.

In Table 4, we see HDI and its subcomponents by population group in 2005. [12] Developed countries are 0.10 HDI points above the next highest group, developing Europe. All of the world's largest countries (about 70% of world population) can be categorized in the Medium HDI group or higher. Developed countries, FSU, China, Indonesia, and Brazil (46% of world population) have HDIs above 0.70. The same group of countries also has literacy rates above 89%.

[12] All numbers in Table 4 are population-weighted.

The descriptive trends reported in this section fit into a longer term story of progress in life expectancy, education and income. We now turn to the income and non-income determinants of HDI progress, and zoom into the individual and household level factors that explain improvements in life-expectancy and literacy over time. The focus on determinants also draws our attention to the way income relates to other dimensions of well-being.

4 DETERMINANTS OF HUMAN DEVELOPMENT TRENDS

In this section we address determinants of HDI change. We start by testing whether changes in human development exhibit absolute or conditional convergence in the sense described by Robert Barro for economic growth across countries (Barro 1991; Barro and Sala-i-Martin 1992). We discuss some of the methodological differences between the economic growth literature and our findings. We then perform a cross-sectional regression analysis comparing years at the beginning and end of our sample. Finally, we examine whether "institutions rule" HDI as Rodrik, Subramanian, and Trebbi (2004) have found they do for income.

4.1 HDI and the Barro Growth Model

In this section we test the explanatory power of a simple 'Barro-style' growth model for HDI. We begin by comparing a classic economic growth convergence estimate for income, HDI, and the non-income components of HDI. We begin by estimating the following regression:

$$\ln(INC_{2005,i} / INC_{1970,i}) = b_0 + b_1(INC_{1970,i}) + b_2(FEMSCH_{1970,i}) + b_3(LE_{1970,i}) + b_4(TRADE_i) + b_5(INFL_i) + b_6(GOV_i) + e_i$$

Where $INC_{t,i}$ is.GDP per capita in year *t* and country *i*, FEMSCH is the ratio of female literacy to male literacy, LE is life expectancy, TRADE is average merchandise trade as a share of GDP from 1970 to 2005, INFL is average inflation from 1970 to 2005, GOV is the average Polity IV index over the same period, and *e* is an iid error term.

In Table 7, we begin by running the above specification on income in columns (1) and (4). We find that in the more typical Barro model in column (1) (omitting education and life expectancy)

inflation and governance has explanatory power not present in column (2), where HDI is the dependent variable. In column (2) inflation is insignificant, and governance has a negative coefficient. Unlike for HDI and its non-income components (column (3)), initial income level is not an effective predictor of income growth from 1970 to 2005. When education and life expectancy are included, initial income appears to gain some effect. Trade, inflation, and governance lose statistical significance.

The above exercise draws on theory developed to explain income growth, which is modeled by the Barro specification. While we explore what might be a more appropriate empirical model for non-income HD dimensions below, there is room to speculate on what a long-run model of human development looks like, and whether or not to use some of the assumptions from the economic growth literature.

4.2 Cross-Sectional Analysis

In this section we perform a cross-sectional analysis of the non-income components comparing 1970 and 2000. We estimate the equation

$$Y_{t,i} = b_0 + b_1(DEM_{t,i}) + b_2(ED_{t,i}) + b_3(INC_{t,i}) + b_4(HLTH_{t,i}) + b_5(WATER_{t,i}) + b_6(GOV_{t,i}) + e_i$$

where $Y_{t,i}$ is our component (life expectancy, literacy, or enrolment) in year t for country i, DEM is a vector of demography variables, ED is education,[13] INC is income, HLTH is health, TECH is technology, and GOV is governance. We measure demography using fertility rates and share of population in urban areas. For income we use GDP per capita. Education is measured by literacy and ratio of female to male literacy. For life expectancy, we include HIV as the only health measure. For literacy, we include life expectancy. WATER is measured by the share of population with access to adequate sanitation or clean water.

In Table 8 we show the results of the above specification. We see that low fertility is a good predictor of high life expectancy for all years and groups of countries. While HIV/AIDS was not yet a major problem in 1970, the virus had a highly significant, negative effect on life expectancy

[13] Education variables are omitted when literacy or enrolment is the dependent variable.

in 2000. Water and income were important factors for all countries in both 1970 and 2000. When the population of literate women was closer to or exceeded that of males, countries tended to have higher life expectancy in 1970. However, this relationship disappears in 2000.

More urban countries had higher literacy in 1970, but this correlation vanishes in 2000. For enrolment, urbanization is positive and statistically significant only in 2000. Oddly, access to water had a negative effect on literacy in developing countries in 1970 and 2000. Access to adequate sanitation has a positive, significant effect for both groups of countries in 2000. Water and sanitation both are statistically insignificant for enrolment. Governance has a statistically significant and positive effect for developing countries in 2000.

Our analysis shows the general pattern that what is true for developing countries tends to be true for all countries. However, we are constrained by our sample size in this respect, as we have only seven developed countries in our life expectancy regressions and nine in literacy. While income is jointly significant with water and sanitation for life expectancy and for developing countries in 2000, nowhere is it independently significant and its joint significance may be driven by the water and sanitation variables. We also find that female literacy had a greater impact on life expectancy in 1970 than 2000.

4.3 Do Institutions Rule HDI?

In this section we test four hypotheses on human development progress, correcting for endogeneity. The first three hypotheses emerge from the larger economic development literature. Following Rodrik, Subramanian, and Trebbi (2004), we test whether geography, trade and institutions have a statistically significant effect on human development. As is common when attempting to identify causal relationships, income regressions tend to be rife with endogeneity. In order to overcome this problem, Rodrik, et al employ an instrumental variables approach. They instrument the three variables with measures of rule of law, distance from the equator and the Sachs-Warner openness index, respectively. While distance is clearly exogenous, European settler mortality rates (ESMR) and the geography-based Frankel-Romer index are used as instruments for institutions and trade. We add the ratio of female literacy to their model, and using OLS, we estimate the following empirical specification:

$$INC_i = b_0 + b_1(FEMSCH) + b_2(INST)_i + b_3(TRADE)_i + b_4(GEO)_i + e_i$$

where INC_i is GDP per capita for country *i*, INST is rule of law, TRADE is the Sach-Warner openness index, GEO is distance from the equator, and *e* is an error term. Following Deaton (2007), Cutler, Deaton and Lleras-Muney (2005) and Ranis, Stewart and Samman (2005), we examine the gender dimension of child mortality reduction by including the ratio of the literate female population to the literate male population, FEMSCH. Deaton's work on the determinants of child mortality points to the need to control both for technological change in reducing child mortality and accounting for female literacy. We instrument for female literacy using both the years since women received full rights to vote and years since women received full rights to run for office.

In Table 9, we report the above specification using OLS and 2SLS and use income, HDI, life expectancy, and literacy as dependent variables. The most prominent result is that female schooling is highly significant in every OLS specification, but none of the 2SLS. This result could be due to the fact that years of female suffrage is a poor instrument. Similarly, while geography appears to have explanatory power in the OLS regressions, its statistical significance vanishes with the inclusion of rule of law in the 2SLS regressions with income as the dependent variable, and it is now here significant in the non-income regressions.[14] Table 9 reports the standardized coefficients of each variable, which also allows us to compare the magnitudes of the effects of each channel. In each full model (columns (4) and (8)), the effect of female schooling is several times greater than that of institutions in both the OLS-income regression and still 100% greater in the 2SLS-income regression. Female literacy alone dominates in the non-income 2SLS regressions.

As we mention above, years of women's political rights may be an unsatisfactory instrument. For example, one can imagine a scenario where a country is sufficiently wealthy to provide everyone access to education. Subsequently women—having been educated—become more aware of their

[14] Separately, we use the same sample as Rodrik, et al (2004), which is restricted to countries with ESMR data, that is, former colonies. To expand the sample, we set ESMR to zero for former colonial power and former Soviet bloc countries. Qualitatively, the results in both samples are very similar.

political deprivation and empowered to lobby for their rights. In this case, wealth drives gender equality. However, the inability to construct appropriate time-varying instruments prevents us from drawing firm conclusions on what drives these movements.

5 CONCLUSIONS

This paper reviews trends in human development since 1970, as measured by the Human Development Index (a composite index of income per capita, literacy, school enrolment and life expectancy). We consider whether trends in human development are different from trends in economic growth, and whether determinants of change are specific to a human development model of growth. To answer these questions, we assemble a 111 country data set from 1970 to 2005 that makes HDI changes comparable both within and between countries. We find three main results from the descriptive part of the paper. First, there is evidence of poorer countries catching-up with rich countries, particularly with respect to the life-expectancy and literacy dimensions. In addition, we find that the income and non-income components of HDI change are uncorrelated, thus undermining the common view that they occur jointly. Second, and behind these averages, we find a great deal of heterogeneity by region, sub-component and period of reference. In our sample, only one country experiences a reversal in its human development level over the 35-year period; 110 countries experience advances. Achievements are faster for the pre-1990 period, and are faster in Asia and the Middle East throughout the whole period. Progress on HDI achievements tends to be literacy-led, while progress in Asia tends to be life-expectancy-led. Improvements in Latin America and Eastern Europe are mixed. These results contrast with the conventional portrait of development progress, largely inferred from the economic growth literature. Human development progress is uneven within countries and for different sub-components of the index (see Grimm et al. 2009).

Third, we find that the story of outliers (high and low achievers) is sensitive to alternative measures of HDI progress. We present top/bottom ten lists for two measures of change: the annualized rate of HDI change and deviations from a global HDI long-run trend. HDI progress is fastest in Nepal, Bangladesh and Lao PDR. When measured by deviations from a long term HDI trend, Nepal, Indonesia and Tunisia are the strongest performers. We also contrast the top 10 performers in HDI with the top 10 performers for GDP per capita. The exercise highlights the

differences between growth-led and HDI-led development. The most rapid improvements in life-expectancy and literacy are not occurring in the fastest growing economies of the world. They are occurring in a subset of lower and middle income countries in Asia, the Middle East and northern Africa. Closer work on the high and low achievers is needed on a country-by-country basis.

Three results emerge from the second part of the paper, focusing on determinants of HDI trends. First, we find evidence of absolute and conditional convergence of human development over time. We borrow from the cross-country economic growth literature to test for convergence on different specifications of HDI progress. The exercise yields some interesting insights into the dynamics of human development change. We test alternative specifications of human development progress in the remainder of the paper.

Does "income matter" as a driver of human development? We run a cross section regression on the non-income components of the HDI (literacy and life-expectancy). We find that income is not a significant predictor of life expectancy --once we account for urbanization, fertility and female schooling. While cross-sectional analyses sometimes suggest that levels of life expectancy and literacy are really representing levels of income, our results indicate that drivers of improvements in health and education differ from the forces that lead to income growth.

Finally, we test whether "gender matters" as a driver of human development, controlling both for endogeneity and other determinants of structural change. Here we use instruments for institutions, geography, trade and changes in gender relations. We find that neither institutions (settler mortality rates, Acemoglu, Johnson and Robinson 2001) nor geography (distance from Equator, Sachs and Warner 1996), is consistently statistically significant for different specifications of HDI, life-expectancy and literacy progress.

Our birds-eye view of human development suggests that social convergence is significant. Human development trends from 1970 to 2005 fit into a longer term trend of demographic and population change. Demographic transitions, urbanization and declining fertility rates have accelerated life-expectancy and literacy achievements over the past half-century (UNDESA 2009). We believe the underlying drivers of these changes are linked to individual and

household-level decisions concerning fertility and female schooling. Although correlated, we do not find evidence to suggest that human development trends can be explained by factors associated with economic growth. Holding income constant, social factors seem to be driving the aggregate human development story. Two issues remain unexplored in this paper. The first is inequality (see Foster, Lopez-Calva and Szekely 2003 and Seth 2009). Further research might explore the regional and sub-dimension inequality observed in the descriptive trends, or focus on the additional effects of inequality over overall HDI progress. The second issue is public policy. Although we did not find policy variables to be significant in this paper, our focus on the long-run does not preclude testing policy drivers and shock for shorter time-intervals and for alternative subsets of countries (see Ranis and Stewart 2007; Ocampo, Jomo and Khan 2007). The story of successful and failed policy interventions is likely to be an important part of the overall story of human development trends over time.

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FIGURES

Figure 1 – GDP and HDI: Levels vs Growth

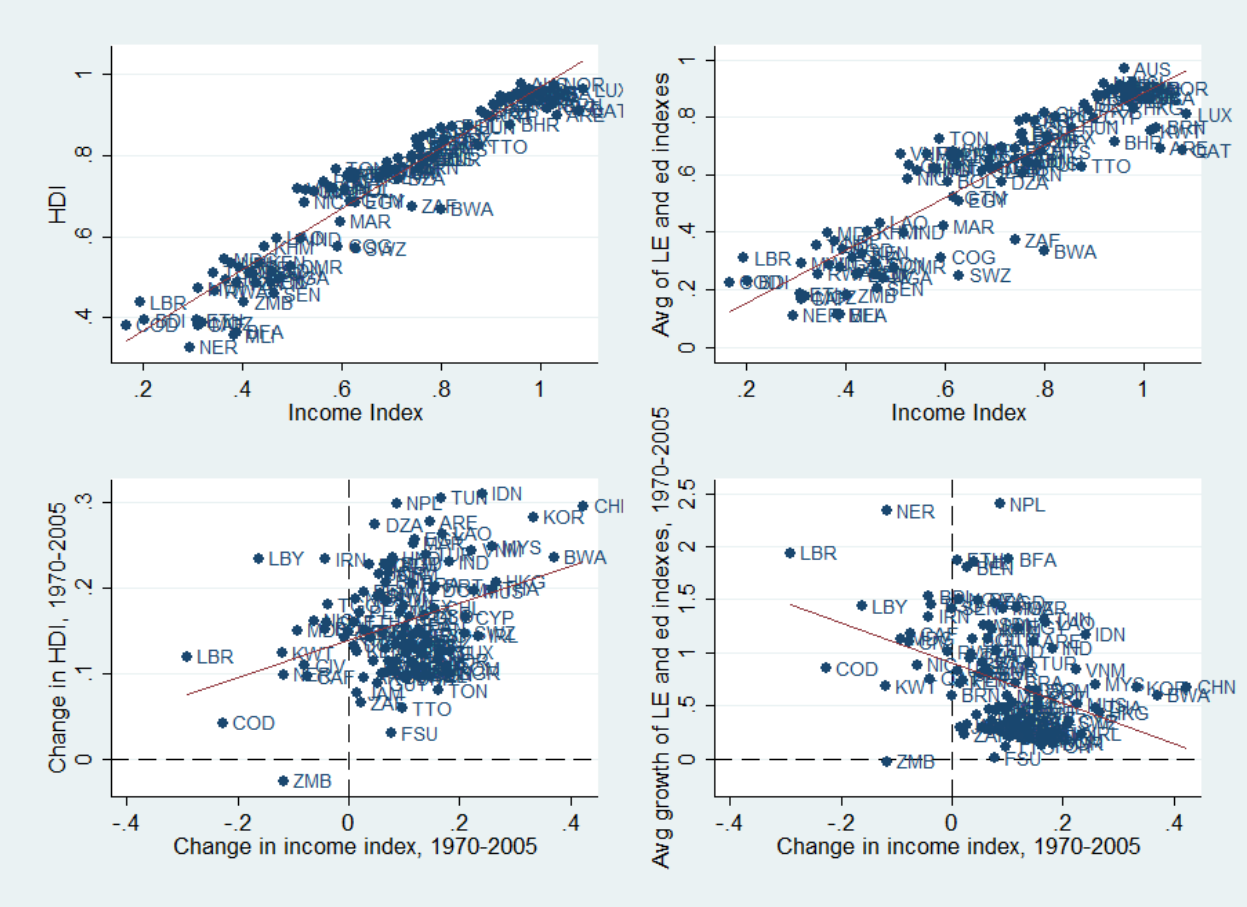


Figure 2 – How HDI and Income move together, by region, 1970-2005

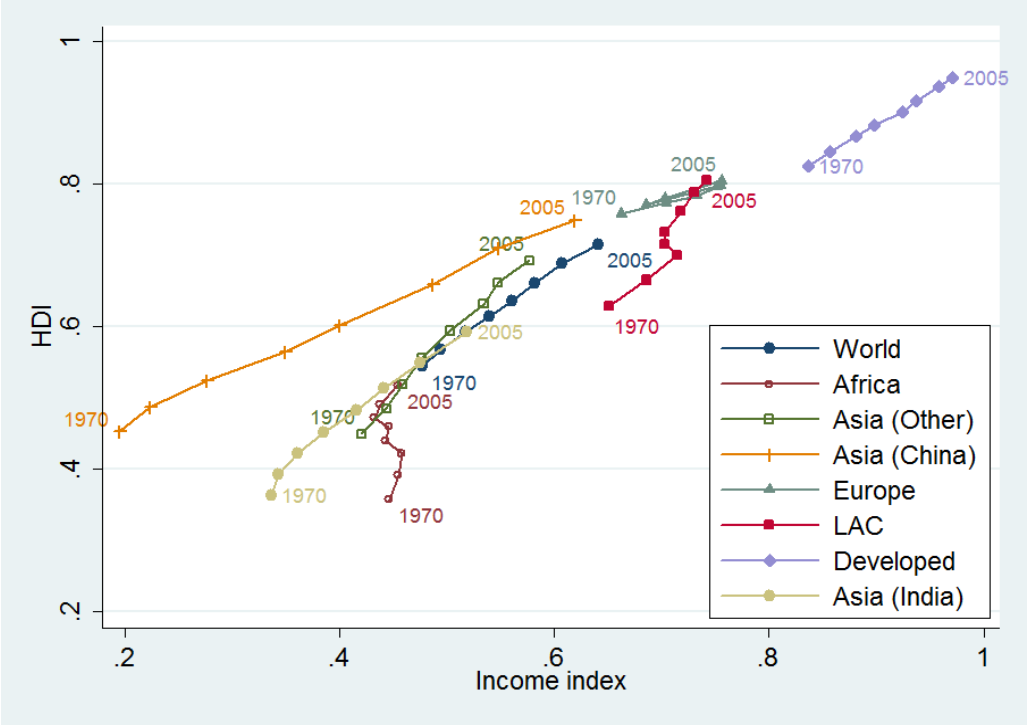


Figure 3 – How Education and Income move together, by region, 1970-2005

Figure 4 – How LE and Income move together, by region, 1970-2005

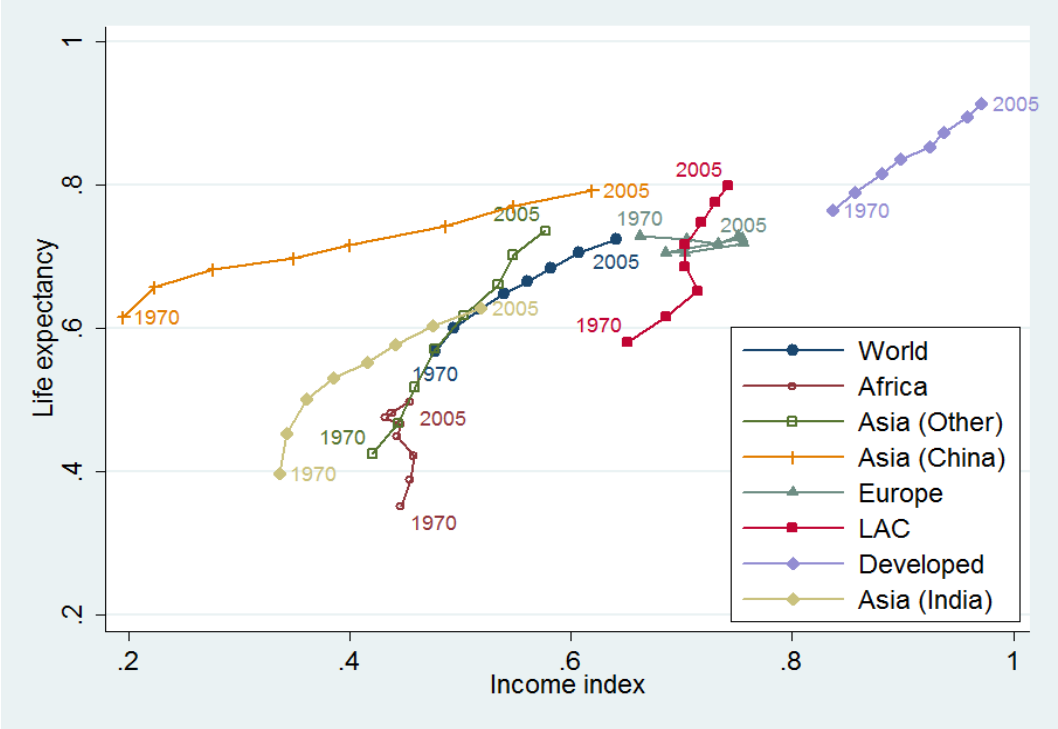


Figure 5 – HDI Trends, by region, 1970-2005

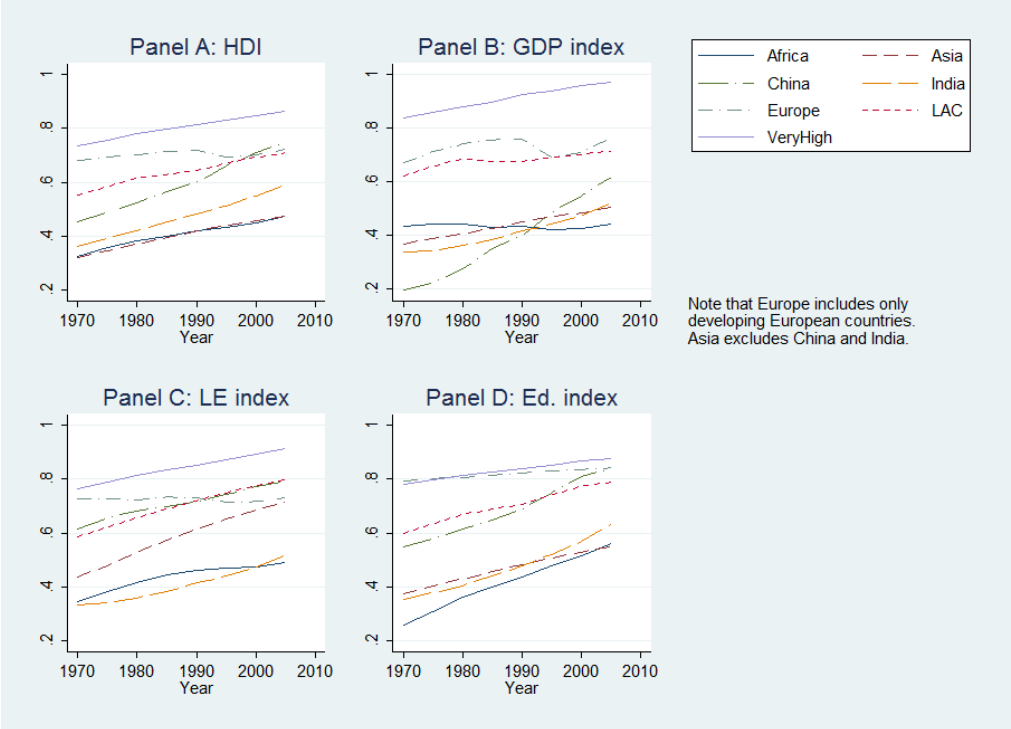


Figure 6 – Developed vs Developing Achievement Ratios, by region, 1970-2005

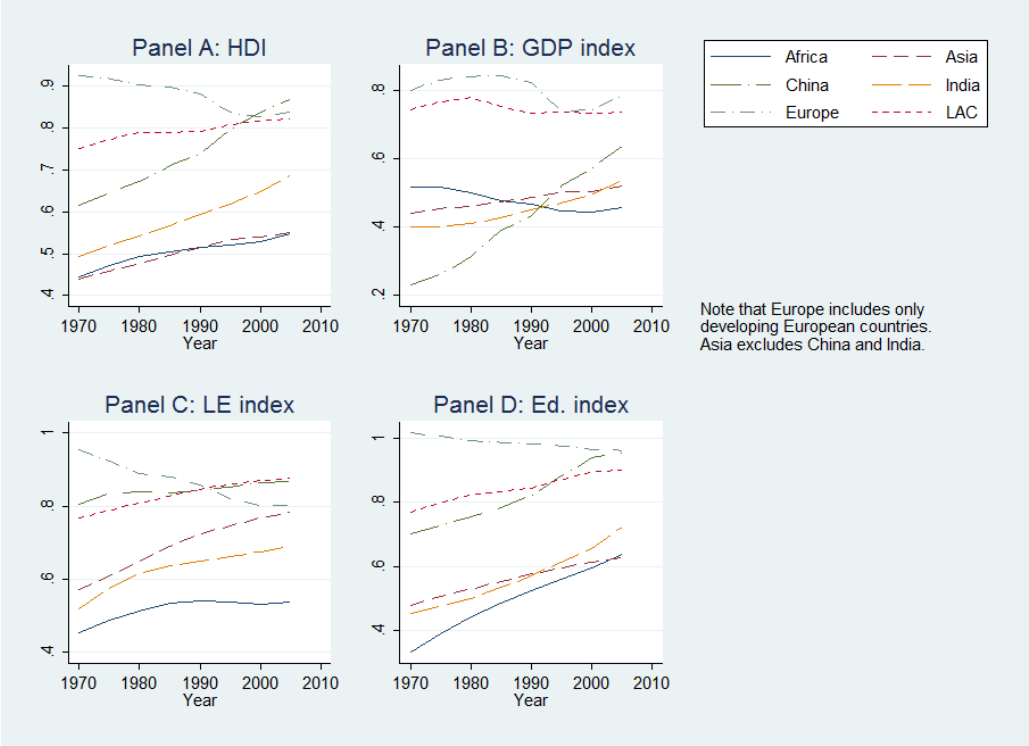


Figure 7 – HDI by Performance measure, by region, 1970-2005

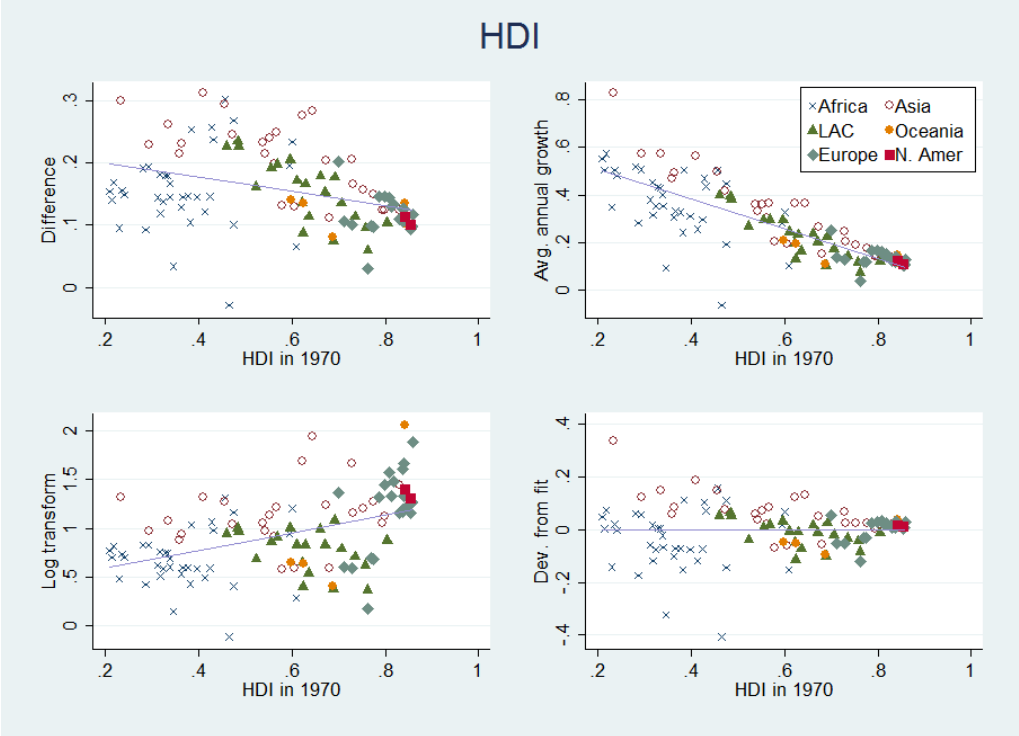


Figure 8 – GDP by Performance measure, by region, 1970-2005

Figure 9 – Literacy by Performance measure, by region, 1970-2005

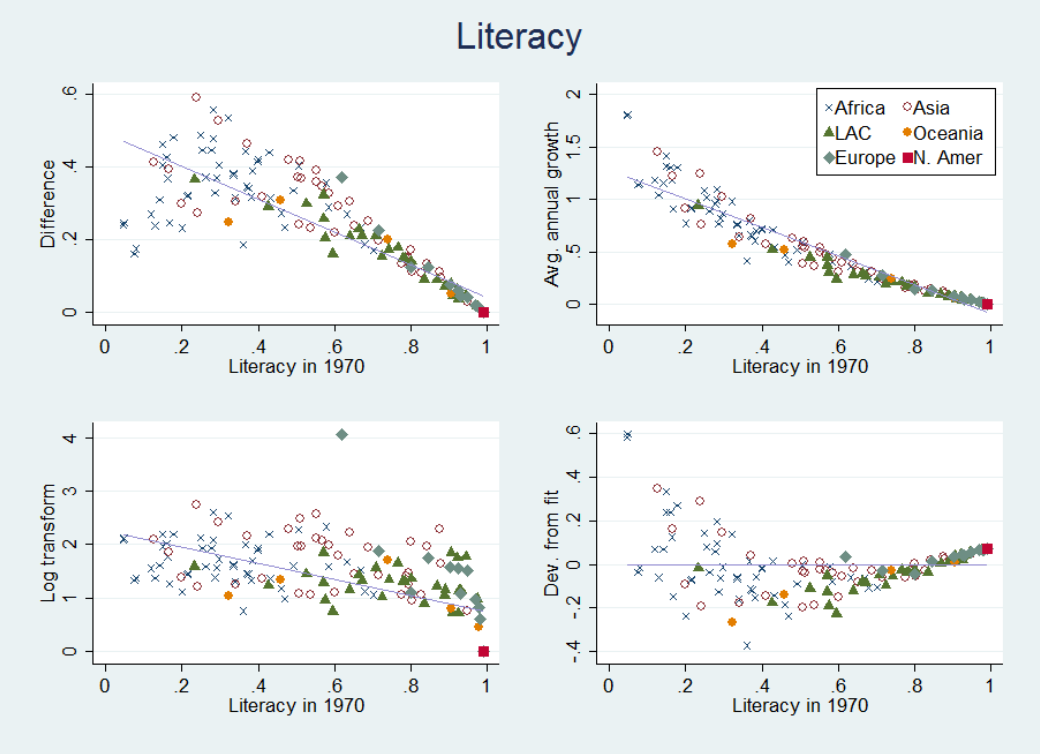


Figure 10 – Enrolment by Performance measure, by region, 1970-2005

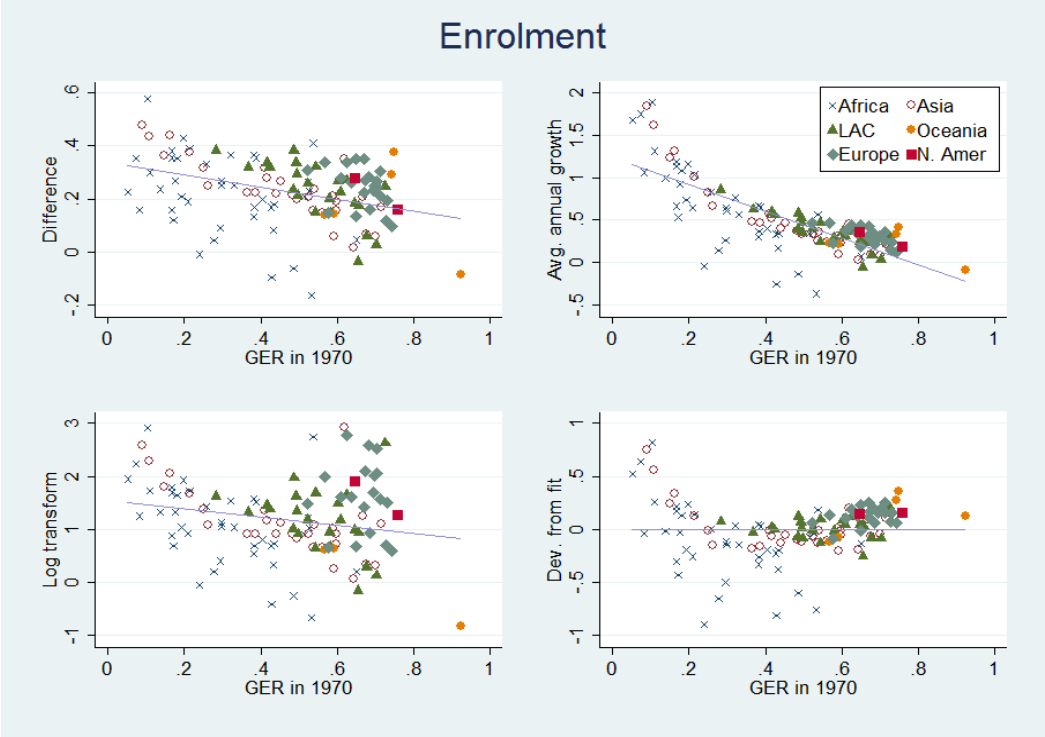


Figure 11 – Life Expectancy by Performance measure, by region, 1970-2005

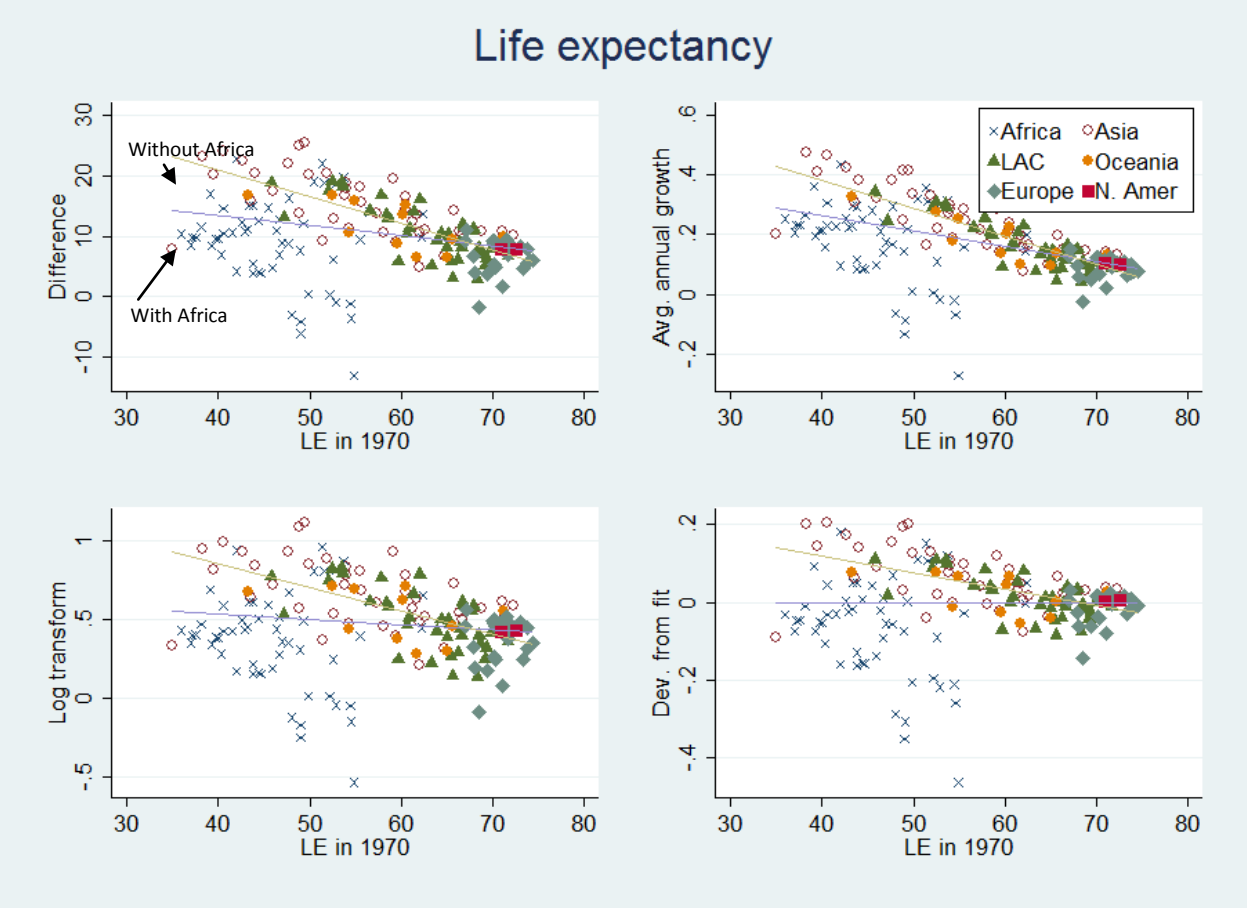


Figure 12 – HDI and component growth rates, by region, 1970-2005

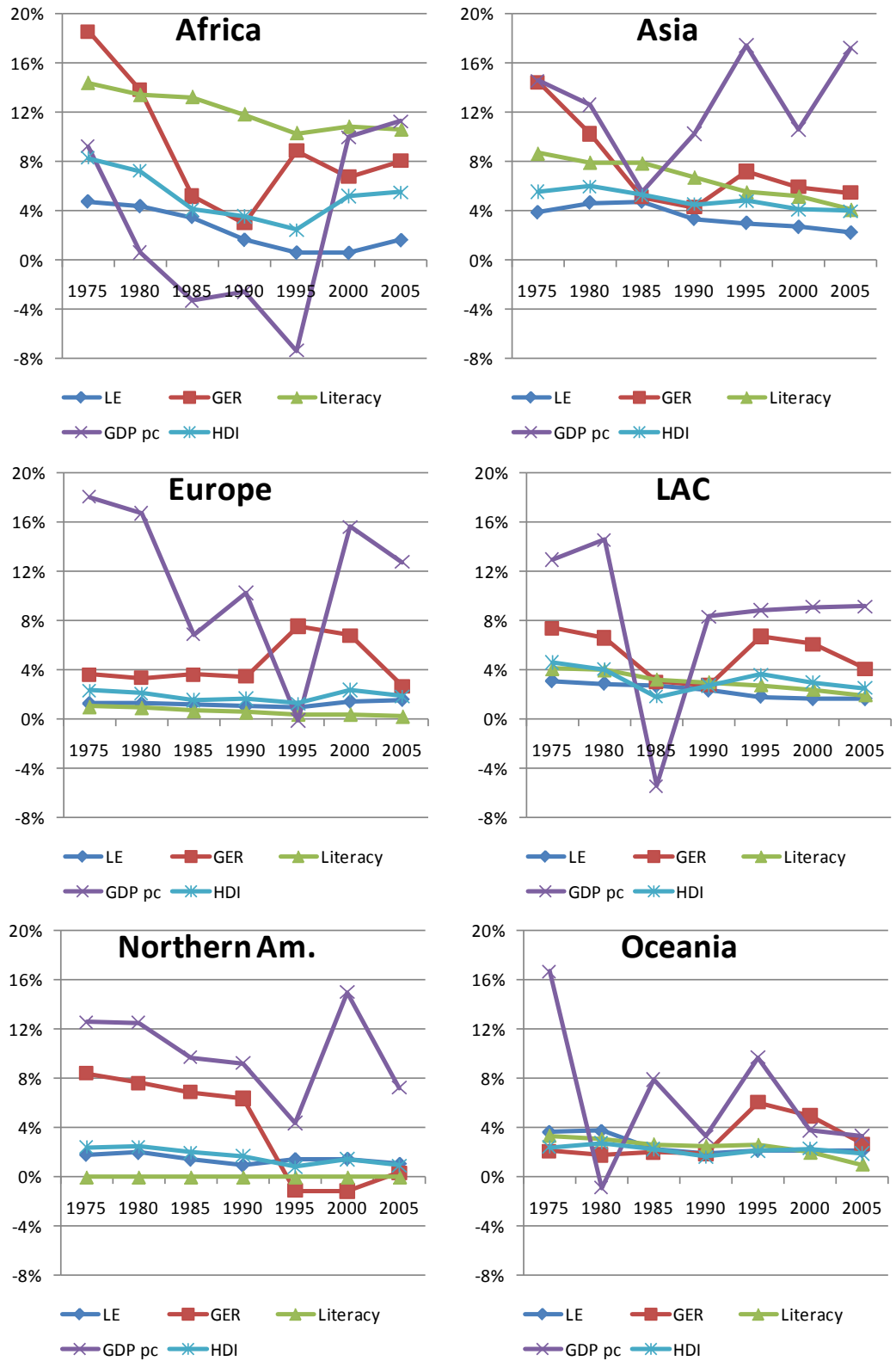


Figure 13 – HDI and component growth rates, by HDI Group, 1970-2005

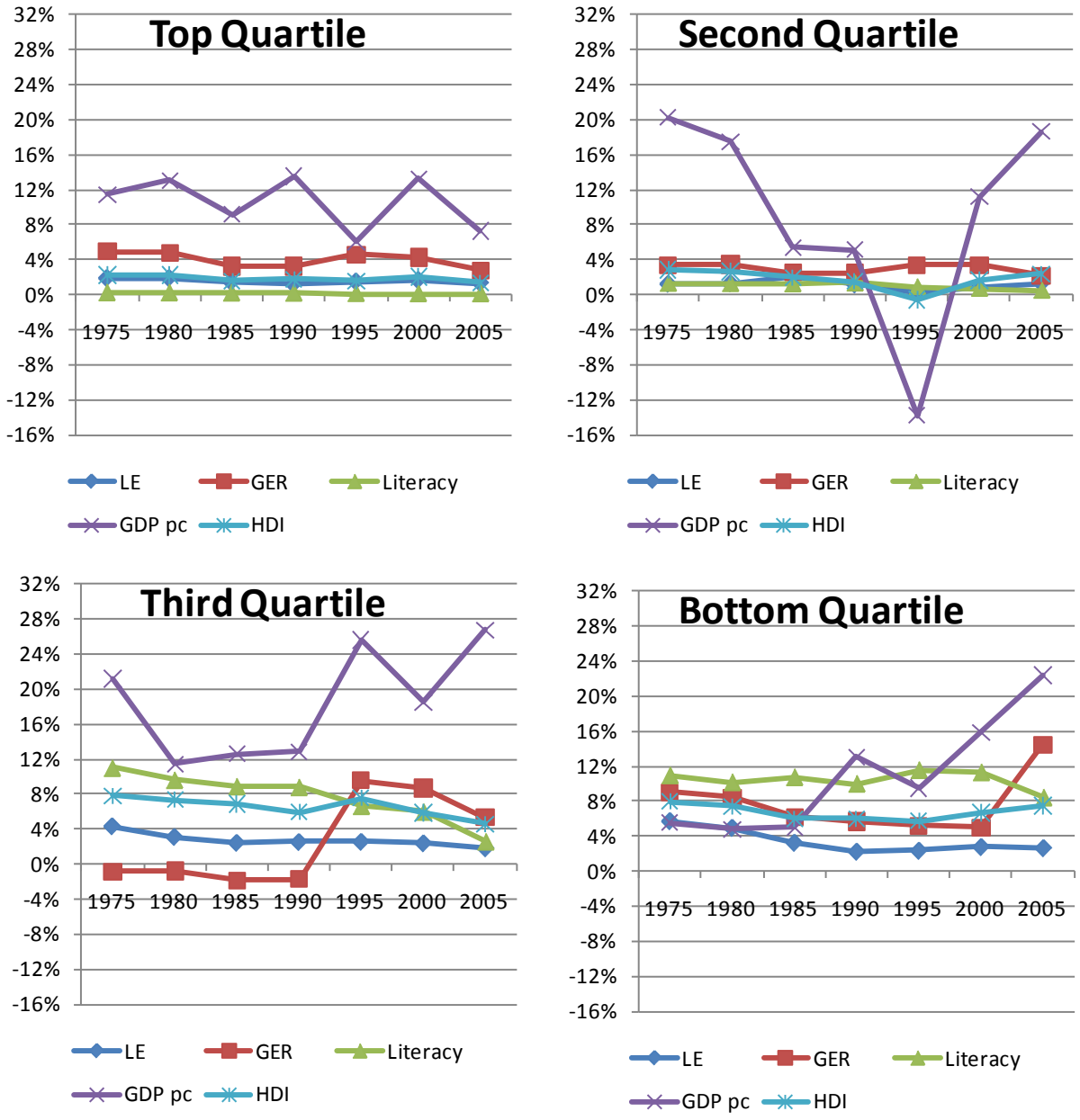
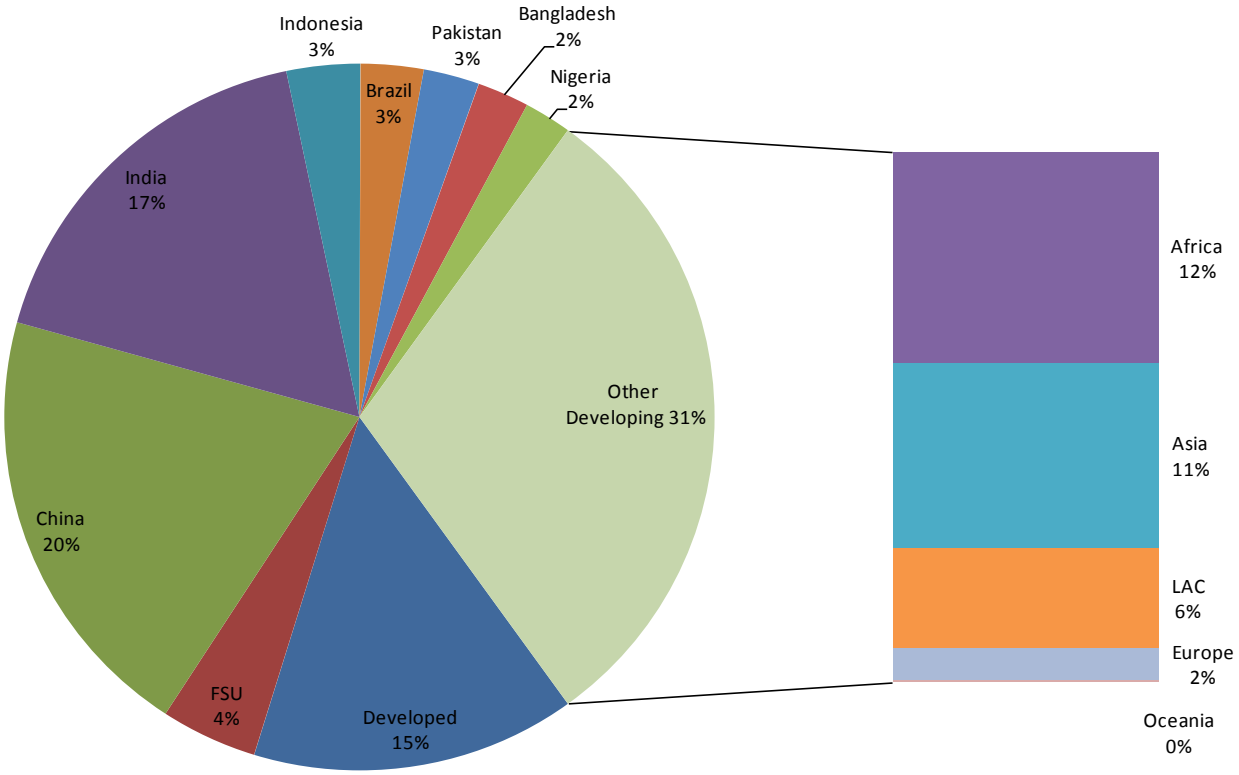


Figure 14 – Share of World Population



7 TABLES

Table 1 – Measures of Performance

1) Simple differences	(Index in year *t*) - (Index in year *t-1*)
2) Average annual growth rates	Ln[(Index in year *t*)/(Index in yeat *t-1*)]
3) Unbounded log-transformation	Ln[(Index in year *t*)/(1-Index in year *t*)] - Ln[(Index in year *t-1*)/(1-Index in year *t-1*)]
4) Deviation from a bivariate trend regression	Regress measure (2) on the initial value (index in year *t-1*). Predict the fitted values of this regression. Subtract the realized growth rate from the predicted growth. Measure (4) is this difference.

Table 2 – Net increases and Decreases in HDI and Components

		LE		GER		Literacy		GDP pc		HDI	
		(-)	(+)	(-)	(+)	(-)	(+)	(-)	(+)	(-)	(+)
No. of countries that saw an increase/ decrease	1970-75	4	170	13	108	2	128	26	129	3	108
	1975-80	7	167	13	108	2	129	40	115	4	107
	1980-85	5	168	31	90	1	130	71	84	7	104
	1985-90	16	158	31	90	2	129	54	101	7	104
	1990-95	26	147	23	98	4	127	50	105	15	96
	1995-00	21	153	23	98	2	126	30	125	8	103
	2000-05	15	159	31	90	4	124	17	138	6	105
	1970-2005	8	166	6	115	0	131	22	133	1	110
Share of countries that saw an increase/ decrease	1970-75	2.3%	97.7%	10.7%	89.3%	1.5%	98.5%	16.8%	83.2%	2.7%	97.3%
	1975-80	4.0%	96.0%	10.7%	89.3%	1.5%	98.5%	25.8%	74.2%	3.6%	96.4%
	1980-85	2.9%	97.1%	25.6%	74.4%	0.8%	99.2%	45.8%	54.2%	6.3%	93.7%
	1985-90	9.2%	90.8%	25.6%	74.4%	1.5%	98.5%	34.8%	65.2%	6.3%	93.7%
	1990-95	15.0%	85.0%	19.0%	81.0%	3.1%	96.9%	32.3%	67.7%	13.5%	86.5%
	1995-00	12.1%	87.9%	19.0%	81.0%	1.6%	98.4%	19.4%	80.6%	7.2%	92.8%
	2000-05	8.6%	91.4%	25.6%	74.4%	3.1%	96.9%	11.0%	89.0%	5.4%	94.6%
	1970-2005	4.6%	95.4%	5.0%	95.0%	0.0%	100.0%	14.2%	85.8%	0.9%	99.1%

Table 3 – Summary Statistics, HDI and Components, by HDI group and year

HDI							Income index						
	HDI Group							HDI Group					
Year		1	2	3	4	Total	Year		1	2	3	4	Total
1970	Mean	0.80	0.67	0.47	0.29	0.58	1970	Mean	0.83	0.66	0.48	0.37	0.58
	S.D.	0.06	0.07	0.12	0.07	0.20		S.D.	0.11	0.11	0.12	0.09	0.20
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
1975	Mean	0.83	0.70	0.50	0.31	0.60	1975	Mean	0.86	0.69	0.50	0.37	0.60
	S.D.	0.05	0.06	0.11	0.07	0.20		S.D.	0.11	0.11	0.13	0.08	0.21
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
1980	Mean	0.85	0.73	0.53	0.34	0.63	1980	Mean	0.89	0.72	0.51	0.37	0.62
	S.D.	0.04	0.05	0.11	0.08	0.20		S.D.	0.10	0.10	0.12	0.07	0.21
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
1985	Mean	0.86	0.75	0.56	0.35	0.65	1985	Mean	0.89	0.72	0.51	0.36	0.62
	S.D.	0.04	0.04	0.11	0.08	0.19		S.D.	0.07	0.08	0.12	0.07	0.21
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
1990	Mean	0.88	0.77	0.59	0.35	0.67	1990	Mean	0.91	0.73	0.52	0.34	0.63
	S.D.	0.03	0.04	0.11	0.07	0.19		S.D.	0.06	0.07	0.11	0.06	0.21
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
1995	Mean	0.90	0.79	0.61	0.36	0.69	1995	Mean	0.93	0.75	0.53	0.32	0.64
	S.D.	0.03	0.03	0.11	0.07	0.20		S.D.	0.05	0.06	0.11	0.09	0.22
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
2000	Mean	0.93	0.81	0.63	0.39	0.71	2000	Mean	0.95	0.76	0.55	0.33	0.65
	S.D.	0.03	0.03	0.10	0.07	0.19		S.D.	0.05	0.06	0.11	0.08	0.22
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
2005	Mean	0.94	0.83	0.66	0.42	0.73	2005	Mean	0.97	0.79	0.57	0.34	0.67
	S.D.	0.02	0.03	0.10	0.06	0.19		S.D.	0.05	0.06	0.12	0.09	0.23
	Obs.	31	20	43	16	110		Obs.	35	31	65	21	152
Total	Mean	0.87	0.76	0.57	0.35	0.66	Total	Mean	0.90	0.73	0.52	0.35	0.63
	S.D.	0.06	0.07	0.12	0.08	0.20		S.D.	0.09	0.09	0.12	0.08	0.21
	Obs.	248	160	344	128	880		Obs.	280	248	520	168	1216

LE index							Ed. Index						
	HDI Group							HDI Group					
Year		1	2	3	4	Total	Year		1	2	3	4	Total
1970	Mean	0.75	0.65	0.46	0.29	0.53	1970	Mean	0.81	0.71	0.48	0.22	0.58
	S.D.	0.06	0.10	0.12	0.07	0.18		S.D.	0.13	0.14	0.20	0.14	0.26
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
1975	Mean	0.77	0.68	0.49	0.32	0.57	1975	Mean	0.83	0.74	0.53	0.26	0.61
	S.D.	0.05	0.08	0.13	0.08	0.18		S.D.	0.11	0.12	0.18	0.15	0.25
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
1980	Mean	0.80	0.71	0.54	0.35	0.60	1980	Mean	0.85	0.77	0.57	0.29	0.64
	S.D.	0.04	0.07	0.12	0.09	0.18		S.D.	0.09	0.10	0.17	0.16	0.23
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
1985	Mean	0.82	0.74	0.57	0.37	0.63	1985	Mean	0.87	0.80	0.61	0.33	0.67
	S.D.	0.04	0.06	0.12	0.09	0.17		S.D.	0.08	0.08	0.16	0.16	0.22
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
1990	Mean	0.85	0.77	0.61	0.38	0.65	1990	Mean	0.89	0.82	0.64	0.36	0.70
	S.D.	0.03	0.05	0.12	0.10	0.17		S.D.	0.06	0.07	0.15	0.17	0.21
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
1995	Mean	0.86	0.79	0.63	0.39	0.67	1995	Mean	0.91	0.85	0.68	0.40	0.73
	S.D.	0.03	0.04	0.12	0.10	0.18		S.D.	0.06	0.06	0.13	0.17	0.20
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
2000	Mean	0.88	0.81	0.64	0.41	0.69	2000	Mean	0.94	0.87	0.72	0.45	0.76
	S.D.	0.03	0.04	0.13	0.09	0.18		S.D.	0.06	0.05	0.12	0.17	0.20
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
2005	Mean	0.91	0.83	0.66	0.44	0.71	2005	Mean	0.95	0.89	0.75	0.50	0.79
	S.D.	0.03	0.04	0.14	0.09	0.18		S.D.	0.05	0.04	0.11	0.15	0.18
	Obs.	35	37	73	26	171		Obs.	31	21	44	17	113
Total	Mean	0.83	0.75	0.57	0.37	0.63	Total	Mean	0.88	0.81	0.62	0.35	0.69
	S.D.	0.06	0.08	0.14	0.10	0.19		S.D.	0.10	0.10	0.18	0.18	0.23
	Obs.	280	296	584	208	1368		Obs.	248	168	352	136	904

Table 4 – Population and HDI Components by Population Group, 2005

		Pop.	% of World	LE	GER	Literacy	GDP	HDI
Developed		961,261	14.8%	79.8	92.0%	98.7%	34,293	0.95
FSU		284,833	4.4%	66.6	83.8%	98.8%	8,586	0.79
China		1,312,253	20.2%	72.6	65.8%	92.6%	4,076	0.75
India		1,130,618	17.4%	62.7	61.0%	64.5%	2,234	0.59
Indonesia		219,210	3.4%	69.7	69.4%	91.2%	3,197	0.72
Brazil		186,075	2.9%	71.7	87.2%	89.1%	8,505	0.80
Pakistan		165,816	2.5%	65.6	--	49.9%	2,184	--
Bangladesh		153,122	2.4%	64.6	51.2%	51.5%	1,069	0.52
Nigeria		140,879	2.2%	47.3	53.3%	70.0%	1,731	0.50
Other developing	**Africa**	780,015	12.0%	56.4	52.4%	62.6%	2,487	0.52
	Asia	679,197	10.4%	70.5	69.8%	87.2%	5,922	0.74
	LAC	370,057	5.7%	73.7	79.4%	91.0%	9,292	0.81
	Europe	119,082	1.8%	73.8	85.8%	98.5%	12,510	0.85
	Oceania	8,777	0.1%	69.0	73.8%	95.2%	4,137	0.75

	Life Expectancy			Gross Enrolment Rate			Literacy			GDP per capita			Non-income HDI			HDI		
	Rank	Country	% growth, 70-05	Rank	Country	% growth, 70-05	Rank	Country	% growth, 70-05	Rank	Country	% growth, 70-05	Rank	Country	% growth, 70-05	Rank	Country	% growth, 70-05
Top Ten	1	Yemen	47.6%	1	Liberia	188.8%	1	Chad	181.4%	1	China	254.3%	1	Nepal	240.1%	1	Nepal	82.7%
	2	Bhutan	46.8%	2	Nepal	184.2%	2	Niger	180.1%	2	Equatorial Guinea	253.6%	2	Niger	233.6%	2	Bangladesh	57.5%
	3	Western Sahara	43.5%	3	Ethiopia	175.3%	3	Nepal	145.9%	3	Botswana	222.0%	3	Liberia	193.8%	3	Lao PDR	57.5%
	4	Nepal	42.6%	4	Burkina Faso	167.6%	4	Guinea-Bissau	141.3%	4	Korea (Republic of)	199.5%	4	Burkina Faso	187.6%	4	Mozambique	57.3%
	5	Oman	41.6%	5	Bhutan	162.1%	5	Central African Rep.	131.7%	5	Singapore	184.2%	5	Ethiopia	187.1%	5	Indonesia	56.5%
	6	Viet Nam	41.4%	6	Mali	131.6%	6	Burundi	130.8%	6	Maldives	169.1%	6	Mali	185.5%	6	Burkina Faso	55.2%
	7	Timor-Leste	41.2%	7	Cambodia	131.1%	7	Togo	130.3%	7	Saint Kitts and Nevis	163.3%	7	Benin	180.1%	7	Malawi	52.1%
	8	Bangladesh	38.3%	8	Afghanistan	123.8%	8	Oman	124.4%	8	Hong Kong, China (SA	160.0%	8	Afghanistan	154.1%	8	Benin	50.7%
	9	Indonesia	38.2%	9	Benin	118.4%	9	Yemen	121.9%	9	Malta	156.8%	9	Burundi	152.9%	9	Ethiopia	50.7%
	10	Guinea	36.1%	10	Uganda	115.9%	10	Benin	118.7%	10	Thailand	154.9%	10	Nigeria	150.0%	10	Tunisia	50.7%
Bottom Ten	165	Uganda	0.8%	112	Philippines	8.2%	121	Cuba	4.8%	146	Central African Reput	-44.4%	106	Denmark	19.8%	102	Tonga	11.1%
	166	Kenya	0.6%	113	Gabon	6.6%	122	Romania	4.7%	147	Côte d'Ivoire	-46.8%	107	Poland	19.4%	103	Netherlands	11.0%
	167	South Africa	-1.9%	114	Belize	3.8%	123	Italy	4.2%	148	Madagascar	-55.4%	108	Hungary	18.7%	104	Sweden	10.8%
	168	Congo	-2.1%	115	China	2.3%	124	Netherlands Antilles	3.9%	149	Zambia	-70.0%	109	Romania	17.7%	105	Denmark	10.5%
	169	Former Soviet Union	-2.7%	116	Angola	-4.5%	125	Mongolia	2.8%	150	Niger	-70.0%	110	Bulgaria	14.1%	106	Jamaica	10.4%
	170	Swaziland	-6.5%	117	Trinidad and Tobago	-5.8%	126	Former Soviet Union	1.9%	151	Kuwait	-71.7%	111	Tonga	12.0%	107	South Africa	10.2%
	171	Botswana	-6.9%	118	Tonga	-9.8%	127	Barbados	1.7%	152	Libyan Arab Jamahiriy	-97.4%	112	Trinidad and Tobago	11.0%	108	Congo (DR)	9.4%
	172	Lesotho	-8.9%	119	Zambia	-14.1%	128	Poland	1.3%	153	Djibouti	-103.2%	113	Former Soviet Union	0.5%	109	Trinidad and Tobago	7.6%
	173	Zambia	-13.3%	120	Congo (DR)	-25.9%	129	Hungary	0.9%	154	Congo (DR)	-136.0%	114	Zambia	-2.6%	110	Former Soviet Union	3.9%
	174	Zimbabwe	-27.5%	121	Congo	-37.2%	130	Samoa	0.8%	155	Liberia	-174.9%	115	Zimbabwe	-21.1%	111	Zambia	-6.3%

	Life Expectancy			Gross Enrolment Rate			Literacy			GDP per capita			Non-income HDI			HDI		
	Rank	Country	Dev. From Fit, 70-05	Rank	Country	Dev. From Fit, 70-05	Rank	Country	Dev. From Fit, 70-05	Rank	Country	Dev. From Fit, 70-05	Rank	Country	Dev. From Fit, 70-05	Rank	Country	Dev. From Fit, 70-05
Top Ten	1	Bhutan	20.6%	1	Liberia	81.7%	1	Chad	59.9%	1	Equatorial Guinea	193.8%	1	Nepal	105.5%	1	Nepal	33.9%
	2	Yemen	20.2%	2	Nepal	75.1%	2	Niger	58.5%	2	China	192.9%	2	Niger	94.7%	2	Indonesia	18.7%
	3	Oman	20.0%	3	Ethiopia	63.6%	3	Nepal	34.9%	3	Botswana	161.7%	3	Liberia	61.3%	3	Tunisia	15.8%
	4	Viet Nam	19.5%	4	Bhutan	55.6%	4	Guinea-Bissau	33.5%	4	Korea (Republic of)	140.8%	4	Ethiopia	51.6%	4	Lao PDR	15.1%
	5	Western Sahara	18.1%	5	Burkina Faso	52.4%	5	Oman	29.0%	5	Singapore	129.1%	5	Burkina Faso	50.0%	5	China	14.9%
	6	Nepal	17.4%	6	Australia	35.9%	6	Burundi	27.1%	6	Maldives	108.1%	6	Mali	47.9%	6	Korea (Republic of)	13.1%
	7	Indonesia	15.6%	7	Cambodia	33.3%	7	Togo	24.0%	7	Hong Kong, China (SA	105.2%	7	Benin	47.3%	7	Bangladesh	12.6%
	8	Libyan Arab Jamahiriy	15.1%	8	New Zealand	27.3%	8	Central African Rep.	23.8%	8	Saint Kitts and Nevis	104.1%	8	Libyan Arab Jamahiriy	34.9%	8	United Arab Emirates	12.2%
	9	Timor-Leste	14.4%	9	Mali	25.6%	9	Lesotho	19.7%	9	Malta	99.3%	9	Algeria	32.9%	9	Morocco	11.2%
	10	Bangladesh	13.9%	10	Denmark	24.8%	10	Yemen	16.3%	10	Macao, China (SAR)	98.2%	10	Australia	24.0%	10	Algeria	11.1%
Bottom Ten	165	Congo (DR)	-16.2%	112	Tanzania	-30.5%	121	Comoros	-18.6%	146	Nicaragua	-95.6%	106	Cameroon	-33.9%	102	Liberia	-11.7%
	166	Kenya	-19.6%	113	Cameroon	-33.3%	122	Iraq	-18.6%	147	Central African Reput	-105.1%	107	Congo (DR)	-37.5%	103	Kenya	-11.8%
	167	Uganda	-20.5%	114	Ghana	-38.0%	123	Nicaragua	-19.0%	148	Côte d'Ivoire	-106.1%	108	Kenya	-39.2%	104	Former Soviet Union	-12.0%
	168	Congo	-21.1%	115	Sudan	-43.1%	124	Bangladesh	-19.2%	149	Madagascar	-115.5%	109	Botswana	-46.4%	105	Niger	-14.1%
	169	South Africa	-21.8%	116	Côte d'Ivoire	-50.3%	125	Cambodia	-19.7%	150	Libyan Arab Jamahiriy	-127.5%	110	Lesotho	-51.1%	106	Congo	-14.5%
	170	Botswana	-25.8%	117	Zambia	-60.6%	126	Belize	-22.8%	151	Zambia	-129.5%	111	Congo	-58.5%	107	South Africa	-15.2%
	171	Swaziland	-28.8%	118	Central African Reput	-65.4%	127	Zambia	-23.7%	152	Niger	-130.5%	112	South Africa	-62.1%	108	Côte d'Ivoire	-15.3%
	172	Lesotho	-30.7%	119	Congo	-76.2%	128	Mozambique	-23.8%	153	Djibouti	-159.9%	113	Swaziland	-73.5%	109	Central African Rep.	-17.3%
	173	Zambia	-35.1%	120	Congo (DR)	-81.5%	129	Papua New Guinea	-27.0%	154	Congo (DR)	-196.6%	114	Zambia	-108.3%	110	Congo (DR)	-32.4%
	174	Zimbabwe	-46.2%	121	Angola	-90.1%	130	Mauritania	-37.4%	155	Liberia	-234.7%	115	Zimbabwe	-111.0%	111	Zambia	-40.6%

Table 5 - Top and bottom performers by HDI component

Table 6 – Number of countries by top growth component, region, HDI group, 1970-2005

	Education	Income	Health
Africa	33	1	1
Latin America and the Caribbean	6	2	13
Oceania	1	1	3
Asia	13	5	8
Europe	3	11	8
Northern America	0	0	2
Total	56	20	35
Developed	7	9	15
High	7	6	7
Medium	26	4	13
Low	16	0	0
Total	56	19	35

Note: The total countries by HDI group only total to 110 because the former Soviet Union has an HDI in our data set, but does not have an official HDI and thus is not in an HDI group.

Table 7 – Barro specification of Income, HDI, and the HDI Non-income components

	(1) GDPpc	(2) HDI	(3) Non-inc	(4) GDPpc	(5) HDI	(6) Non-inc
Ln(GDPpc), 1970	-0.104	**-0.0121**	**-0.206**	**-0.433**	-0.0145	0.0400
	[0.0805]	**[0.00605]****	**[0.0516]*****	**[0.0921]*****	[0.00963]	[0.0331]
Female yrs schooling, 1970				0.712	-0.0331	**-1.099**
				[0.542]	[0.0467]	**[0.224]*****
Life expectancy, 1970				**0.0475**	0.00109	**-0.0245**
				[0.0163]***	[0.00168]	**[0.00666]*****
Average trade, 1970-2005	-2.053	-0.164	-0.542	-2.461	-0.137	0.205
	[4.536]	[0.181]	[2.583]	[3.239]	[0.186]	[0.989]
Average inflation, 1970-2005	**-0.367**	0.0217	0.155	-0.0327	0.0295	-0.0158
	[0.143]**	[0.0160]	[0.106]	[0.195]	[0.0214]	[0.0856]
Governance, 1970-2005	**0.0299**	-0.00250	**-0.0340**	-0.0143	-0.00236	0.00589
	[0.0146]**	[0.00129]*	**[0.00769]*****	[0.0169]	[0.00161]	[0.00688]
Constant	**1.497**	**0.281**	**2.511**	**0.988**	**0.259**	**2.625**
	[0.602]**	**[0.0488]*****	**[0.391]*****	**[0.587]***	**[0.0599]*****	**[0.221]*****
Observations	65	65	65	65	65	65
R-squared	0.099	0.155	0.455	0.396	0.164	0.807

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 8 – Cross-sectional analysis of life expectancy and literacy, 1970-2000

Dependent variable	Life expectancy				Literacy				Gross Enrolment			
Year	1970		2000		1970		2000		1970		2000	
Countries	All	Developing	All	Developing	All	Developing	All	Developing	All	Developing	All	Developing
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(5)	(6)	(7)	(8)
Fertility	-0.260	-0.286	-0.479	-0.402	-0.116	-0.254	-0.459	-0.171	0.137	0.00545	-0.281	-0.0816
	[0.0666]***	[0.0771]***	[0.0900]***	[0.101]***	[0.120]	[0.140]*	[0.173]***	[0.192]	[0.114]	[0.145]	[0.201]	[0.240]
Urban population (%)	0.0195	0.0379	0.0962	0.0396	0.217	0.246	-0.00645	-0.000125	0.251	0.247	0.264	0.251
	[0.0675]	[0.0647]	[0.0740]	[0.0849]	[0.121]*	[0.125]*	[0.0717]	[0.0704]	[0.153]	[0.148]	[0.115]**	[0.113]**
Polity IV	0.00138	-0.00550	-0.0549	-0.0634	0.110	0.104	0.0148	0.120	0.0910	0.101	0.136	0.268
	[0.0588]	[0.0629]	[0.0489]	[0.0454]	[0.0600]*	[0.0586]*	[0.0840]	[0.0917]	[0.0600]	[0.0560]*	[0.0913]	[0.0881]***
Literacy ratio	0.185	0.0915	0.161	0.133								
	[0.127]	[0.131]	[0.110]	[0.111]								
Female schooling	0.125	0.138	-0.0119	0.0924								
	[0.0664]*	[0.0709]*	[0.126]	[0.124]								
Life Expectancy					0.722	0.561	-0.00862	0.0400	0.675	0.462	0.131	0.0630
					[0.180]***	[0.217]**	[0.107]	[0.0978]	[0.190]***	[0.225]**	[0.136]	[0.139]
Ln(GDPpc)	-0.0531	-0.110	0.194	0.137	-0.0622	0.000189	0.0329	0.125	-0.0861	-0.0460	0.155	0.253
	[0.150]	[0.151]	[0.111]*	[0.125]	[0.174]	[0.184]	[0.123]	[0.113]	[0.233]	[0.233]	[0.152]	[0.141]*
Water	0.0371	-0.0163	0.103	0.173	-0.0952	-0.248	-0.0243	-0.145	0.103	-0.0789	-0.0497	-0.163
	[0.0817]	[0.101]	[0.0603]*	[0.0616]***	[0.0895]	[0.121]**	[0.123]	[0.137]	[0.111]	[0.120]	[0.100]	[0.104]
Sanitation	0.304	0.405	-0.0153	0.0321	0.270	0.210	0.361	0.335	0.0697	0.113	0.123	0.110
	[0.132]**	[0.138]***	[0.0938]	[0.108]	[0.163]	[0.216]	[0.141]**	[0.122]***	[0.170]	[0.191]	[0.137]	[0.154]
HIV prevalence rate			-0.165	-0.170								
			[0.0248]***	[0.0268]***								
Constant	-0.261	-0.285	0.108	0.106	-0.0317	0.0774	-0.0198	0.181	-0.287	-0.214	0.133	0.328
	[0.0805]***	[0.0877]***	[0.0648]	[0.0839]	[0.0829]	[0.106]	[0.0876]	[0.0839]**	[0.0886]***	[0.102]**	[0.128]	[0.162]**
Observations	55	45	69	58	65	55	80	69	59	49	71	61
R-squared	0.849	0.799	0.895	0.868	0.859	0.806	0.734	0.643	0.781	0.675	0.720	0.632
Income and tech, p-val	0.00374	0.00556	0.0524	0.0113	0.340	0.184	0.0198	0.0185	0.680	0.886	0.453	0.0857

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

HIV is set to 0 for years before 1990, when data was unavailable. 'Income and tech' reports the joint significance of income, water, and sanit.

Table 9 – Cross-sectional analysis of HDI and institutions

	Income								HDI							
	OLS				2SLS				OLS				2SLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Female schooling	**3.670**	**3.182**	**2.919**	**2.456**	**5.572**	**4.197**	**4.187**	2.437	**4.289**	**3.671**	**3.526**	**3.300**	**6.665**	**5.009**	**5.062**	4.195
	[0.342]* **	**[0.307]*** **	**[0.292]*** **	**[0.289]*** **	**[0.934]*** **	**[0.872]*** **	**[0.881]*** **	[4.955]	**[0.293]*** **	**[0.256]*** **	**[0.259]*** **	**[0.246]*** **	**[1.360]*** **	**[1.506]*** **	**[1.534]*** **	[4.687]
Distance from Eq.		**0.406**	**0.450**	**0.263**		**0.355**	**0.376**	-0.0179		**0.391**	**0.414**	**0.281**		**0.307**	**0.311**	0.185
		[0.0780]* **	**[0.0709]*** **	**[0.0788]*** **		**[0.0920]*** **	**[0.0841]*** **	[0.864]		**[0.0586]*** **	**[0.0624]*** **	**[0.0749]*** **		**[0.117]** **	**[0.121]** **	[0.899]
Trade openness			**0.187**	0.0634			0.126	-0.156			0.0959	0.0419			0.0510	-0.0295
			[0.0851] **	[0.0629]			[0.0834]	[0.673]			[0.0542]*	[0.0538]			[0.0802]	[0.539]
Rule of Law				**0.455**				1.047				**0.276**				0.335
				[0.0927]* **				[2.405]				**[0.0724]*** **				[2.196]
Constant	**-3.241**	**-2.739**	**-2.467**	**-2.024**	**-4.821**	**-3.594**	**-3.551**	-1.956	**-3.624**	**-3.026**	**-2.865**	**-2.652**	**-5.622**	**-4.167**	**-4.193**	-3.434
	[0.288]* **	**[0.246]*** **	**[0.238]*** **	**[0.250]*** **	**[0.791]*** **	**[0.732]*** **	**[0.736]*** **	[4.454]	**[0.260]*** **	**[0.215]*** **	**[0.221]*** **	**[0.218]*** **	**[1.161]*** **	**[1.292]*** **	**[1.325]*** **	[4.118]
Observations	80	80	80	80	80	80	80	80	66	66	66	66	66	66	66	66
R-squared	0.511	0.650	0.685	0.776	0.374	0.613	0.632	0.610	0.699	0.830	0.838	0.869	0.484	0.769	0.763	0.840

	Life Expectancy								Literacy							
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Female schooling	**3.729**	**3.203**	**3.004**	**2.689**	**7.218**	**6.150**	**6.178**	7.370	**4.384**	**4.222**	**4.181**	**4.148**	**5.174**	**4.793**	**4.800**	2.970
	[0.359]* **	**[0.326]*** **	**[0.336]*** **	**[0.351]*** **	**[1.659]*** **	**[1.921]*** **	**[1.943]*** **	[8.992]	**[0.261]*** **	**[0.265]*** **	**[0.266]*** **	**[0.283]*** **	**[0.812]*** **	**[0.823]*** **	**[0.821]*** **	[6.280]
Distance from Eq.		**0.435**	**0.467**	**0.340**		**0.282**	**0.290**	0.642		**0.134**	**0.141**	**0.128**		**0.104**	**0.104**	-0.345
		[0.0839]* **	**[0.0843]*** **	**[0.0923]*** **		**[0.154]***	**[0.153]***	[1.749]		**[0.0341]*** **	**[0.0351]*** **	**[0.0526]** **		**[0.0422]** **	**[0.0450]** **	[1.234]
Trade openness			**0.145**	0.0583			0.0619	0.318			0.0303	0.0214			0.00104	-0.334
			[0.0665] **	[0.0547]			[0.1000]	[1.391]			[0.0417]	[0.0449]			[0.0668]	[0.960]
Rule of Law				**0.306**				-0.880				0.0315				1.156
				[0.0826]* **				[4.723]				[0.0791]				[3.205]
Constant	**-2.984**	**-2.444**	**-2.234**	**-1.936**	**-5.893**	**-4.936**	**-4.942**	-6.040	**-3.568**	**-3.402**	**-3.358**	**-3.327**	**-4.227**	**-3.884**	**-3.890**	-2.224
	[0.328]* **	**[0.277]*** **	**[0.291]*** **	**[0.306]*** **	**[1.418]*** **	**[1.655]*** **	**[1.675]*** **	[8.108]	**[0.228]*** **	**[0.232]*** **	**[0.235]*** **	**[0.248]*** **	**[0.683]*** **	**[0.698]*** **	**[0.701]*** **	[5.625]
Observations	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
R-squared	0.503	0.653	0.674	0.713	0.063	0.358	0.350		0.817	0.833	0.834	0.835	0.790	0.820	0.820	0.213

	Gross Enrolment							
	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
Female schooling	**0.875**	**0.760**	**0.756**	**0.727**	**1.256**	**0.928**	**0.915**	1.175
	[0.0696]* **	**[0.0641]*** **	**[0.0705]*** **	**[0.0701]*** **	**[0.238]*** **	**[0.276]*** **	**[0.263]*** **	[1.154]
Distance from Eq.		**0.0728**	**0.0735**	**0.0567**		**0.0623**	**0.0615**	0.0921
		[0.0141]* **	**[0.0154]*** **	**[0.0203]*** **		**[0.0252]** **	**[0.0257]** **	[0.225]
Trade openness			0.00302	-0.00384			-0.0110	0.00923
			[0.0156]	[0.0165]			[0.0214]	[0.135]
Rule of Law				**0.0350**				-0.0872
				[0.0208]*				[0.545]
Constant	-0.112	-0.000765	0.00427	0.0313	-0.433	-0.144	-0.137	-0.364
	[0.0625]*	[0.0565]	[0.0639]	[0.0647]	[0.203]**	[0.237]	[0.229]	[1.015]
Observations	66	66	66	66	66	66	66	66
R-squared	0.642	0.743	0.743	0.754	0.520	0.722	0.725	0.536

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1