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Why Are We Worried About Income? Nearly Everything that Matters is Converging

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Summary. — Convergence of national GDP/capita numbers is a common, but narrow, measure of global success or failure in development. This paper takes a broader range of quality of life variables covering health, education, rights and infrastructure and examines if they are converging across countries. It finds that these measures *are* converging as a rule and (where we have data) that they have been converging for some time. The paper turns to a discussion of what might be driving convergence in quality of life even as incomes diverge, and what this might mean for the donor community.

Key words — convergence, quality of life, income

1. INTRODUCTION

Since at least the time of Solow's paper on the theory of economic growth (1956) the development economics profession has been fascinated by the topic of economic convergence. We know that, over the long-term, there has been a widening of the income gap between rich and poor. Simply, all countries started out poor, but some are now rich. In 1000 AD, both Western Europe and Africa had the same GDP/capita of $450, by 1998 Western Europe was 13 times richer than Africa (Maddison, 2001). Beyond that, the literature discusses factors such as the speed, shape, extent and timing of the divergence (Pritchett, 1997; Quah, 1993). Perhaps the largest section of the literature discusses conditional convergence—or, what it takes for a poor country to grow faster than a rich one.

This fascination with income is driven by humanitarian impulses—the desire for improvements in the global quality of life. We have come a long way from the view, common until the 1820s that increased riches would bring increased mortality, for example, through "diseases of civilization" such as obesity, gout and venereal disease (Szreter, 1997). [1] Today, income is surely the most common gauge for quality of life, especially for economists. To quote Robert Lucas:

> [I]s there some action a government could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, what exactly? If not, what is it about the "nature of India" that makes it so? The consequences for human welfare involved in questions like this are simply staggering: once one starts to think about them, it is hard to think about anything else (Lucas, 1988). [2]

This world view of the centrality of income can be justified by numerous studies linking income with other potential measures for (elements of) the quality of life. People in countries with higher GDPs per capita have longer life expectancies, lower infant mortality, better access to basic education, better protection of their political rights—the list goes on (see for example, Pritchett & Summers, 1993; or Gangadharan & Valenzuela, 2001). Even if income is not your chosen measure of quality of life, at first glance it appears that improving incomes will improve whatever your chosen

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measure happens to be, then. Given that, it is a simple step to the conclusion that, if income is diverging, so is the quality of life of citizens in different nations.

From this conclusion follows that regions or countries on the wrong side of income divergence are comprehensively failing. This is most clear in the case of Africa, where GNP per capita growth rates over the past 25 years have done well to remain at zero. Sender (1999) refers to a number of recent pieces on Africa from sources left and right that describe the African situation as "tragedy," "crisis", "catastrophe," "collapse" or "slow rot". [3]

At the same time, a number of economists and economic historians have provided some evidence to doubt the conventional wisdom that income is the driving factor behind improvements in a number of potential measures of elements of the quality of life. Further, there is evidence that a number of quality of life measures are converging across countries over time. This paper reviews some of this evidence, and (after a brief discussion of methodological issues) goes on to examine the issue of divergence and convergence in quality of life over a number of variables and over an extended time frame. For selected variables, the paper then turns to attempts to explain the evidence that emerges. The paper concludes with some preliminary thoughts about what the results might mean for development policy.

2. THE LINK BETWEEN INCOME AND QUALITY OF LIFE

It is hardly novel to argue that GDP per capita is an incomplete measure of a country's economic progress. Kuznets (1941) proposed that welfare measures might start with national income, but should also incorporate other factors such as nonmarket activities, leisure and inequality. The UNDP's Human Development Index and the Overseas Development Council's Physical Quality of Life Index were later attempts to come up with one number that captured such a multidimensional view of development progress.

While, as suggested above, numerous studies have found a link between income and other potential measures of the quality of life, it is also easy to show that across countries or regions at a single time, that link is far from linear and universal. The Indian state of Kerala is perhaps the best-known example. The state has an income per capita below $300 yet a life expectancy of 72, an infant mortality rate of 13 per 1,000 and only 9% illiterate—far better than a number of wealthier states and countries (Veron, 2001; see also Bradshaw & Fraser, 1989).

Looking over time, a number of studies find a tenuous link between various health measures, for example, and growing income. Preston (1975) estimates that income could only account for perhaps 10–25% of the growth in life expectancy in the world as a whole between the 1930s and the 1960s. Looking at a wider range of measures, Easterly (1999) found that almost all of the quality of life variables that he could find (including infant mortality, life expectancy and war deaths per capita) were not correlated with the rate of growth in that country over the last 40 years, but instead with improvements over time common to all countries. [4]

3. EVIDENCE FOR CONVERGENCE IN MEASURES OF THE QUALITY OF LIFE

Related to this literature is exploration of convergence in nonincome quality of life variables. Although there are some studies that suggest the reverse, [5] most analyses of the issue of relative growth in quality of life variables find evidence of convergence in their chosen measures.

Crafts (2000) notes that the human development index (constructed from measures of income (discounted at higher levels), literacy and life expectancy) has seen a reduction in the gap between developing countries as a whole and the leading country since 1950, and for Latin America and Eastern Europe a catch up during 1913–50 as well (see also Sab & Smith, 2001, for evidence of education and health converging over 1970–96).

Ram (1992) studies crosscountry inequality of calorie supply, life expectancy and adult literacy using four population-weighted measures (Bourguignon's "L" and a related entropy measure, weighted standard deviation and weighted absolute mean deviation), and finds both that inequality of these indicators across the world is very small compared to income inequality and that, over 1960 to 1985–88 period, inequality of life expectancy and literacy has been falling (see also Ram, 1980, 1982). Ingram (1992) finds that there is strong evidence of convergence in life expectancy, caloric intake, primary enrollment ratios and urbanization, fairly

strong evidence with regard to social expenditures as a percentage of GNP, and weaker evidence with a range of other social indicators. Only for two of his chosen indicators did he find no evidence of convergence—labor force participation and defense expenditures. [6]

This paper builds on the work of Crafts, Ram and Ingram. It is designed to provide a complementary and at some points more comprehensive, discussion of convergence in quality of life indicators. Most studies to date have focused on only a few variables—Crafts (2000) on the three constituents of the Human Development Index and Ram (1992) on calorie intake, literacy and life expectancy, for example. Ingram (1992) does look at a wider range of variables for up to 109 countries over 1960–85. But in addition to using both more and different measures of convergence and social indicators, this paper looks at a longer time period. [7]

4. METHODS OF MEASURING CONVERGENCE AND METHODOLOGICAL ISSUES

There are a number of methods of measuring convergence. "Sigma" convergence is a decline over time of the cross-sectional dispersion of a variable, which can be measured by looking at the size of the standard deviation. For variables that trend upward (or downward) across the world over time, the coefficient of variation (standard deviation divided by the mean) might provide a better reflection of convergence or divergence. A third approach to measuring convergence—used frequently in the literature on crosscountry economic growth—is to see if the variable displays mean reversion. This asks, is the value of a variable at period start inversely correlated with its growth over that period. This measure is known in the literature as beta convergence.

Micklewright and Stewart (1999) note that, because many quality of life variables have a complement (infant mortality against infant survival, for instance), and that because scale invariant measures such as those commonly used in growth regressions might display convergence with one variable whilet displaying divergence with its complement under such circumstances, sigma convergence may be a better measure to use than beta convergence and the coefficient of variation. Take a country in which, over time, one extra infant survives per 1,000 from an initial infant mortality rate of two per 1,000 compared to a second country, where 40 extra children per 1,000 survive from an original infant mortality of 100 per 1,000. Using either the coefficient of variation or beta convergence as defined above, this would count as convergence on the positive variable and divergence on the negative variable. [8]

Having said that, because we are comparing results with the literature on income convergence, beta convergence (where it can be calculated) and the coefficient of variation both remain of interest because they are widely used in this literature. We focus on the coefficient of variation measuring convergence toward 100% on the "positive" variable (for example, infant survival) rather than on coefficient of variation measuring convergence toward zero on the "negative" variable (infant mortality). This is for two reasons.

First, measurement of convergence toward zero instead of convergence toward a maximum "favors" very small absolute changes close to zero above very large absolute changes further from zero—favoring one infant surviving to early childhood over 40 children, using the above example. [9] Given we are interested in global improvements in the quality of life, such favoritism appears perverse.

Second, convergence toward the upper, "positive" value is what is measured in the great majority of the literature on global income trends. While the Millennium Development Goals have placed a welcome focus on reducing the percentage of the population living on below a dollar a day, convergence towards OECD income levels is still the variable of choice for most development economists in this area. [10]

Use of mean reversion as a measure of convergence leads to other issues with potential variables. Some variables are measured in percentages. For growth rates, this raises the question of measuring growth as change in that percentage measure or "percentage percentage-change" (both scores are reported for beta convergence in this case). It should also be noted that the nature of some quality of life variables (inflation, for example) allows for zero and readings that change sign over time, making it frequently impossible to calculate growth rates (this explains some gaps in the reporting on beta convergence scores in the appendix tables).

In order to provide evidence on both sigma, beta and coefficient of variation convergence, we will use the standard deviation and the

coefficient of variation, but also look at the mean reversion of the variable, excluding sample measures with changed signs or zero readings, and looking at both percentage and percentage percentage-change for quality of life variables that are measured in percentage terms. As one further measure, we will use the average indicator for the bottom 20% of countries divided by the average indicator for the top 20%. With variables such as war deaths and inflation, the "bottom 20%" is clearly where a country would wish to find itself—thus convergence is measured by the ratio of bottom to top scores declining. Where the lowest 20% of countries all score zero on the variable in question (as is the case with literacy and war deaths in our sample of variables), the result is not reported. [11]

The debate over the convergence of incomes further raises a number of issues that are relevant to this paper—issues such as the quality of data, and the size of the sample. In early analysis, the theoretical predictions of global convergence were held to be empirically supported, but this was due to a small sample of (now) wealthy countries. We will use as large a sample as the data allow, and report the number of countries and percentage of global population covered in order to minimize (or at least advertise) this problem.

More recent debates over the extent of global poverty also suggest that weighting (does China count the same as Sierra Leone?) and taking the individual rather than the state as the unit of interest, can also significantly alter results (see Sala-i-Martin, 2002). Although we cannot tackle issues connected with in-country inequality of other quality of life variables at the global level for lack of data, we weight some results by country population size. [12]

Finally, a note should be made about the selection of quality of life variables. This was based on no scientific principle, but an effort was made to choose most of the common measures of the quality of life as reflected in, for example, their appearance in reports on development progress such as the UNDP Human Development Report or the World Bank World Development Report. An effort was also made to chose measures with long time series and with strong country coverage. Given the strength of the results, it would be surprising if a broadly similar set of quality of life measures were to come up with radically different results—having said that, there is clearly room for a great deal more work in this area.

Appendix Tables 9 and 10 lay out information on the quality of life variables selected, their source, period and country coverage. Twenty-two separate indicators cover elements of health, education, social, political, and economic performance. The technique employed is to compare start and end period data using the longest time period that allows for significant country coverage. To be part of the data set, data are required for each country at period start and period end. The statistics measuring percentage of global population covered refer to population shares at period start.

5. RESULTS

The results presented in Appendix Tables 11–13 suggest almost every potential quality of life variable shows significant variation across countries. In turn, this suggests that, either throughout history some quality of life indicators have been higher in some parts of the world than others, or that, in some point in the past, there must have been divergence. The available evidence suggests elements of both stories, although with a predominance of the second. [13] The evidence also suggests that more recently (for most of the 20th century) the story is reversed—it is one of convergence.

(a) *Income*

Maddison's recent survey (2001) makes clear the long-term—and continuing—pattern of income divergence highlighted by Pritchett (1997). As we have seen, in 1000 AD, Western Europe and Africa had approximately the same GDP per capita—around $400. By 1998, Africa had caught up with Western Europe's income levels of 180 years earlier, but Western Europe's income per capita was now 13 times higher than the average for Africa.

The unweighted results from our constant GDP PPP dataset, covering 1950–99, suggest stagnation rather than divergence. This may be in part because the country selection excludes a number of African countries which grew slowly. Having said that, with 84% global population coverage, it may be that the weighted figures do accurately reflect some real level of convergence, driven by the strong recent performance of India and China (this would match results presented by Ram and others that suggest weighted income convergence and unweighted stagnation in conver-

gence 1980–2000). [14] The broad story remains the same, however, even using our limited dataset. Evidence of strong divergence at least until the post-war period. Limited evidence of any recent income convergence, and no evidence of strong convergence. The standard deviation, bottom 20% divided by bottom 20% and coefficient of variation measures all suggest no convergence. As we will see, this is a far more negative picture than suggested by the quality of life variables.

Excluding GDP per capita, the figures summarized in Table 1 suggest the following about these broader measures of the quality of life. If one uses the measure most commonly used on the growth literature—beta convergence—100% of the variables are beta converging. By our other favored measure, coefficient of variation, around 86% of variables are converging (the figure for weighted coefficient of variation is 95%). By any of our measures of convergence, over 85% of the variables are converging. As a broad statement, then, it appears safe to say that our variables suggest convergence in quality of life. The next sections report more detailed results for each variable.

Table 1. *Summary statistics on global quality of life convergence*

Measure of Convergence	Percentage of nonincome quality of life variables that suggest convergence
Coefficient of variation	86
Weighted coefficient of variation	95
Bottom 20% divided by top 20%	90
Correlation % growth to start	100
Correlation absolute growth to start	91

Source: Based on statistics in Appendix Tables 11–13.

(b) *Health*

Long-term historical data on life expectancy are scarce. Nonetheless, a pattern does emerge from that data which we have. Table 2 displays estimates on life expectancy in India and the United Kingdom from 1363 onward. It appears that the historical minimum life expectancy is about 24 years. This is the estimate given for India until 1913, when the data from Maddison (2001) suggest a life expectancy of about that level. If that estimate is approximately correct, a strong divergence occurred between India and the United Kingdom as early as the 15th or 16th century. Divergence continued in the 18th and 19th century. The evidence for India and the United Kingdom, however, suggests that divergence slowed dramatically by the start of the 20th century and turned to convergence sometime before the 1950s. For a wider sample of 19 countries—predominantly rich, but including India, Brazil, and Russia, we have data on life expectancy going back to 1870. This confirms the picture was one of broad divergence until some time during 1913–50, where convergence occurred fairly strongly. [15]

Table 2. *Life expectancy, historical estimates for India and the United Kingdom*

Date	India	United Kingdom	India/United Kingdom (%)
1363	24	24.3	99
1543	24	33.7	71
1738	24	34.6	69
1813	24	40.8	59
1913	24.8	53.4	46
1931	26.8	60.8	44
1950	38.7	69.2	56
1999	63	77	82

Sources: For 1364 (data for the period 1301–1425) 1543 (data for period 1541–46) United Kingdom, 1913 and 1950 India and United Kingdom are Maddison (2000). Data for 1931 are from Preston (1975). Data for 1999 are World Bank (2001). India 1363-estimated based on lowest historically recorded life expectancy in Maddison (2001).

The 1950–99 statistics confirm convergence in life expectancy continuing in the post-war period. This was also a period of significant worldwide average growth in life expectancy, suggesting historically remarkable growth for less-developed countries (LDCs). Over 1950–99, data covering 87% of the world's population suggests that weighted average life expectancy has risen from 51 to 69 years while the weighted standard deviation has *fallen* from 13 to 7 years. [16]

One of the factors behind the convergence in life expectancy has been a similarly strong convergence in infant survival. Long-term infant mortality data for Sweden from Mitchell (1998) suggest that from 1751 to sometime in the 1820 and 1830s, infant mortality rates fluctuated between 167 and 286 per 1,000 live births. After that point, mortality rates began to fall. In 1870, infant mortality was 132 deaths

Table 3. *Infant survival per 1,000 live births, historical estimates for India and the United Kingdom*

Date	India	United Kingdom	India/United Kingdom (%)
1840		846	
1870		840	
1900	655	846	77
1913	805	892	90
1950	849	970	88
1990	920	992	93

Sources: 1913–90 for India and 1840–1990 for the United Kingdom is from Mitchell (1998). United Kingdom data are for England and Wales. Johnson (2000) reports estimates from Bombay of 500–600 for infant mortality in 1900. He also notes that urban infant mortality was 30–60% higher than rural mortality in the 19th century for those countries for which we have data. Given that India was predominantly rural in 1900, Indian "national" infant mortality has been estimated as 500/1.45.

Table 4. *Calorie intake, historical estimates for India and the United Kingdom*

Date	India	United Kingdom	India/United Kingdom (%)
1700	1,650	2,095	79
1800	1,650	2,237	74
1934	1,800	3,042	59
1970	2,030	3,316	61
1990	2,243	3,282	68

Sources: Data for United Kingdom 1700 and 1800 are from Johnson (2000), for United Kingdom 1934 Geiger (1999), for India in 1934 from Bennett (1976). Johnson argues that calorie intake prior to the 18th century was probably in the region of 1,650 to 2,000 worldwide, and that Indian calorie intake was already increasing by the time of the first estimates made for 1934. This suggests that India was likely to be at the lower end of the world range in the 1700–1900 period, used to estimate the 1,650 figure for India in 1700 and 1800. 1970 and 1990 data are from Easterly (1999).

in the first year per 1,000 live births. Combined with estimates for long-term infant survival in India presented in Table 3, this suggests both that, as early as the mid-18th century, Northern European infant mortality rates were far lower than rates in India (surely connected with tropical disease rates), but also that infant mortality rates began dropping in Europe at the very start of the industrial revolution. Convergence in infant survival, as with life expectancy, started before 1950, with evidence for India and the United Kingdom suggesting perhaps as early as the first decade of the 1900s. Data for 36 countries including 18 now-developing countries also suggest convergence for infant survival dating back to a period before 1950. [17]

In the post-war period, infant survival has continued to converge rapidly. The coefficient of variation on infant survival approximately halved over a 40-year period, at a time when average infant survival worldwide increased form 924 to 978 per 1,000 live births.

A factor behind both lower infant mortality and longer life expectancy in the developing world, although perhaps not behind the first turn toward health convergence, may be convergence in calorie intake toward required levels. Having said that, the early increase in calorie intake suggested for India in Table 4 is based in part on supposition, and the rapid improvement in calorie intake appears to coincide with the Green Revolution—a post-war phenomenon.

Worldwide, the proportion of the world's population living in countries where per capita food supplies are under 2,200 was 56% in the mid-1960s, compared to below 10% by the 1990s (Johnson, 2000). But, the evidence on convergence using this indicator and that regarding percentage of the population adequately nourished is less clear than that for a number of other variables, with the unweighted coefficient of variation of calorie intake (and those adequately nourished) increasing 1970–90. This does not mean that improvements in diet are not likely candidates for improvements in life expectancy, however. In part, the lack of convergence is a result of calorie intake in "lead" countries reaching levels that reflect harmful intake, at least among a proportion of the population. [18]

(c) *Education*

By the time of the first daily newspaper, printed in London starting in 1702, it is very likely that the great divergence in global literacy levels had begun. In part because literacy became ubiquitous in lead countries fairly early, however, convergence also began very early, almost certainly in the 19th century. By 1913, Table 5 suggests literacy in India was at 9%, and certainly at least since then, the picture is on of rapid convergence with the United Kingdom. Evidence for literacy for 28 countries (including nine now-developing countries) going back to 1913 suggests the same thing, that literacy had certainly begun to converge for these countries prior to the WWII, and quite possibly well before that. [19]

Table 5. *Literacy, historical estimates for India and the United Kingdom*

Date	India	United Kingdom	India/United Kingdom (%)
1500		6	
1830		69	
1870		76	
1913	9	96	9
1950	19	99	19
1999	57	100	57

Sources: 1500 estimate based on extrapolation from Allen (2003), 1830 United Kingdom estimate based on Webb (1963), later data from Crafts (2000) and World Bank (2002).

In the post-war period, our data suggest continuing and rapid convergence in literacy across all measures. During 1950–99, global literacy increased from 52% to 81% of the world, while the weighted average standard deviation dropped from 38% to 17%. It appears that literacy, as one of the earliest quality of life indicators to converge, may be a factor behind the convergence of other variables. This is a topic discussed in more detail in later sections.

One major factor behind global increases in literacy has been far more widespread access to basic education. Easterlin (1981), noting the problems with primary school enrollment as a percentage of population (most importantly that there are variations in the percentage of school-aged population), divides the measure into three broad categories –less than 4% is "relatively little," 4–8% is "moderate" and values greater than 8% "substantial." As is clear from the data in Table 6, United States enrollment has been "substantial" at least since 1840—nonetheless, India has been catching up since some time before 1913, possibly before 1870. For primary education, we have some evidence of convergence going back to 1870 or before for a sample of 17 countries, including Trinidad, Malaysia, Sri Lanka, Indonesia and India. This again suggests that convergence was occurring in primary school enrollees as a percentage of the population as early as the end of the 19th century, if admittedly from a position of strong divergence. [20]

Table 6. *Primary school enrollment (% of total population), historical estimates for India and the United States*

Date	India	United States	India/United States (%)
1840		16.5	
1870	0.3	18.6	1.6
1913	1.9	17.9	10.6
1950	5.2	13.7	38.0
1990	11.8	12.4	95.2

Sources: Data from Mitchell (1998), Maddison (2001) and (1840 United States) Easterlin (1981).

Post-war, the percentage of the world in primary school increased from 6% to 9% while the coefficient of variation fell from 0.85% to 0.71%. We also have two more indicators of educational progress—gross tertiary enrollment as a percentage of the tertiary-age population and average total years of education in the population. For both variables, the coefficient of variation, weighted and unweighted, has declined. Again, this is despite rapid growth worldwide—the (unweighted) global average for gross tertiary enrollment was 6% in 1970 and had risen to 21% by 1997.

(d) *Social indicators*

Turning to a number of socioeconomic indicators, the picture remains broadly positive in the post-war era, with the one exception of war deaths. For income equality, any statement should be prefaced with the note that this variable covers the smallest percentage of the global population of any of our indicators—just 48%. But for these countries, it appears that the coefficient of variation has slightly improved. Looking at the correlation statistics, there remains strong evidence of mean reversion. This may be one small factor behind improvements in some of the other quality of life variables, as we shall see.

Turning to one measure of gender equality, female literacy as a percentage of male literacy, there has both been rapid global improvement (over 1970–2000, the global average ratio has improved from 59% to 80%) but rapid global convergence at the same time, with the unweighted coefficient of variation halving. The percentage of children not in the labor force has also risen and converged over 1960–2000, the average percentage rising from 76% to 90% while the coefficient of variation fell by a third.

The picture for war deaths per capita is perhaps the least encouraging of all reported variables. The average weighted per capita figure has risen, while the coefficient of variation has also increased. While there is some evidence of mean reversion, the period 1960–90 clearly did not see the world become more universally peaceful.

Inflation, usually included in "misery indices" of economic discontent, actually increased on a weighted average measure over 1965–99 (although it is presumably down from its peak in the late 1970s and early 1980s). Despite that, there is yet again evidence of both mean reversion and a decline in coefficients of variation.

Turning to an indicator that may have a place in a happiness index of economic contentment, and certainly gives hints as to growing levels of "non-necessary" consumption, beer production per capita worldwide has nearly doubled on a weighted average basis during 1950–90, while coefficients of variation have fallen. The bottom 20% of the world, on an unweighted basis, has almost quintupled its beer production over those 40 years compared to the top 20% of the world. [21]

Looking at political and civil rights, the interpretation of the results have to be treated with particular care when applied to a one-to-seven ordinal scale. Strictly speaking, convergence can only be measured for cardinal values. [22] Nonetheless, the average score on these variables has risen, there is strong evidence of mean reversion and coefficients of variation have fallen. (Although it should be noted that standard deviations, which may be the most appropriate measure in this case, have remained broadly the same over 1972–2002.)

On a number of measures of infrastructure provision (electric power, cars, radios, and telephones per capita as well as the percentage of the population with access to clean water), the picture is similar to that found in the majority of our other variables: falling coefficients of variation and clear mean reversion even as average levels have increased rapidly. For all infrastructure indicators for which we have evidence, the start of the 20th century must have been a period of divergence, but the last 30–40 years have seen convergence become the norm. [23]

6. WHAT IS GOING ON?

There is not space to discuss all of the above results in detail, and this section will focus on some of the core quality of life variables covering education and health. In brief, the numbers above and additional information presented below suggests that part of the story may be high quality of life returns to small marginal increases in income at low income levels, but there is more to the story than that, quite possibly involving causal relationships between the other quality of life variables themselves.

How do we explain the performance of Africa over the last 50 years? GDP per capita has increased from $477 to just $561 over the 40 years (1960–99), falling from 4.8% to 1.9% of the average for a high-income country. Compare this to an under-five survival rate which has risen from 746 to 839 per 1,000 live births over the same period—or 77% of the high income survival rate to 84% of that rate. In terms of infant survival (86–91%), life expectancy (57–60%, despite the impact of the AIDS crisis reducing life expectancy by three years 1992–99) and gross primary enrollment (35–70%), the trend is also one of convergence (all figures from World Bank, 2000). While Africa remains far behind, it is catching up on these measures, which is more than can be said for its performance on income.

Ingram (1992) concludes that an absolute proportional increase in per capita GDP in low income countries will improve social indicators more than a similar increase in rich countries. Income has a declining marginal impact on quality of life. This is surely part of the story. There is an upper bound to many of our variables (100% for literacy, for example, and effectively around 100 for life expectancy). It is likely that income increases above a certain level add little to improvements to quality of life indicators because that upper bound is already close. Diener and Diener (1995) present some evidence of such a declining return. Their index of basic needs (encompassing factors such as access to drinking water and infant mortality) is only significantly related to income up to about a GNP per capita of $4,000. Convergence of quality of life indicators is then possible with relatively minor increases in developing country incomes.

It appears, however, that more is going on than high returns to small changes in income at low income levels. Even without any increase in GDP, significant improvements in quality of life can be—and frequently have been—accomplished. Table 7 lists the five countries in the Crafts and Maddison data set with negative income growth and what happened to their life expectancy, literacy and primary enrollment 1950–90. [24] The worst performing of these countries in terms of life expectancy (Mozambique) saw a nine-year (approximately 30%) in-

Table 7. *Income, life expectancy, literacy and primary enrollment selected countries 1950, 1990*

Date	Income		Life expectancy		Literacy		Primary enrollment % population	
	1950	1990	1950	1990	1950	1990	1950	1990
Cuba	3,651	3,000	58.8	75	78	95	10.2	8.4
Angola	986	654	30	45	3		0.3	11.7
Nicaragua	1,772	1,505	42.3	64	38	65	8.3	17.6
Mozambique	1,001	859	33.5	43	2	34	2.6	9.0
Bolivia	1,884	1,744	40.4	58	32	78	6.7	19.3

crease in life expectancy over that period. All countries saw a dramatic increase in literacy, and only Cuba saw a decline in primary enrollment as a percentage of population—which had more to do with demographic change than falling net enrollments.

Looking over a wider range of countries over a longer period, it is possible to estimate the changing relationship between income and life expectancy. Based on the life expectancy data, we can determine expected life expectancy at a given income level at different times using regression analysis. Table 8 outlines the results. Broadly, the results suggests that it takes one-tenth the income to achieve the same life expectancy in 1999 as it took in 1870. Life expectancy for countries at $300 GDP/capita today have a slightly higher life expectancy than countries with a GDP per capita of $3,000 in 1870 and countries with a GDP per capita of $3,000 today have almost exactly the same life expectancy as would have been predicted for a country with a GDP per capita of $30,000 in 1870 (although this is an out-of-sample forecast). It is also worth noting how much more egalitarian the distribution of life expectancy has become on this measure—in 1870, the predicted life expectancy for a person living in a country with an income of $300 per capita was 35% of that for $30,000 per capita—by 1999, that had reached 55%.

Table 8. *Predicted relationship between income and life expectancy over time*

GDP per capita (constant PPP $)	Predicted life expectancy in given year		
	1870	1950	1999
300	22.7	33.2	45.8
3,000	43.7	58.8	64.2
30,000	64.7	84.5	82.6

Source: Based on a regression analysis of life expectancy and GDP/capita (sources in Appendix Table 9). Regression results as follows. **1870**: Life = 9.11 × Ln(GDP/capita) − 29.2; **1950**: Life = 11.14 × Ln(GDP/capita) − 30.3; **1999**: Life = 7.98 × Ln(GDP/capita) + 0.3.

Improved allocation of resources, and access to improved resources (such as vaccines that greatly reduce the cost of combating disease) will be one factor behind this improved performance. It appears only reasonable to assume that the massive increase in access to primary education in developing countries must have something to do with unprecedented increases in literacy, and there does appear to be some role for public health programs in explaining health outcomes. [25] One reason to think that public action may be playing a role in the health performance of developing countries is that urban mortality in developing countries is lower than rural mortality—a state of affairs only reached in Europe and the United States after extensive public interventions to improve the health of city living. [26] Urbanization may indeed be a factor in the recent convergence of quality of life—rural–urban migration has been ongoing even in developing countries that have seen little economic growth (Fay & Opal, 2000), and providing social services to urban residents is easier than to rural populations.

Both Gini and gender inequality also appear to be closely related to mortality and morbidity, even when absolute levels of income have been taken into account (Das Gupta, 1990; Hanmer & White, 1999a, 1999b; Thorbecke & Charumilind, 2002; Waldmann, 1992). Indeed, it should be noted that a number of these studies find that, once other quality of life variables have been accounted for, income has no statistically significant independent effect on mortality variables (see also Flegg, 1982). [27]

The interlinkage between various other measures of quality of life that is as strong or stronger than the relationship with income is widespread. [28] It may be that for the core health measures, and some of the social and political indicators, it is improvements in other such quality of life measures (rather than income) that are driving convergence. [29]

This story does not work as well for infrastructure variables, however. Here, at least for some of the variables (which measure infrastructure stocks), it may be that gains represent convergence to a steady-state capital stock over a period where new investment was higher than depreciation. For broadcasting and telecommunications (and perhaps a lesser extent power), the story is also one of technological advance making access cheaper—so that the same expenditure buys far more infrastructure over time. This may suggest, in the absence of continuing technology advance, convergence may slow over time.

7. CONCLUSION

It should be noted that if global income statistics were reported in a different manner, they would also show evidence of convergence. Across countries, the percentage of populations living on above a dollar a day on a population-weighted measure is converging (Sala-i-Martin, 2002)—so fast that the Millennium Development Goal of halving the world population living under that income measure has already been met (World Bank, 2004). This example also points up that we are more likely to see convergence in variables where there is an upper bound that many countries have already reached (100% of the population living above a dollar a day in this case). Nonetheless, the convergence results reported at the least suggest progress on these indicators of the quality of life which is widespread.

The broad picture of success painted by these and other statistics presented here may suggest new life for currently unfashionable drivers of development. Even if the state, or aid, or globalization, or the Washington Consensus has not had much success in promoting convergence in incomes toward OECD levels, any or all of them might be able to take some credit for quality of life convergence.

Much of the development debate recently has been motivated by the idea that we are failing—developing countries are being left behind and 40 years of state action and foreign aid has done nothing to help that. [30] A broader measure of quality of life should perhaps make us look at the Third World "failures" a little differently. Other quality of life gaps were never as bad for other variables as they were for income—the income measure has always overplayed the difference between India and the United States. Further, and despite the tragedy of AIDS and looming environmental catastrophes, it appears difficult to argue with the statement that quality of life has improved over the past 50 years worldwide and that, for 50 years and sometimes longer, it has improved more rapidly in the developing world than in the developed world. Comparing India to the United Kingdom and United States, for example, convergence began sometime prior to 1950 for literacy and life expectancy and prior to 1913 for primary education. If we are concerned about broader quality of life measures, then, developing countries may have seen their performance excessively maligned (along with inter-war colonies and international donor agencies, perhaps). [31]

The evidence presented above also suggests something about the nature of that success. There has been convergence across a wide range of indicators of the quality of life. Given that there has not been convergence in the standard income indicator, this may suggest that income is only one among a number of factors in determining quality of life outcomes. [32] In turn, this suggests some hope that improvements can be sustained even in the absence of sustained income growth. [33]

The extent of the role that governments have had to play in improving quality of life remains arguable. Literacy appears to be an important factor and government efforts to expand schooling must have played a role here. It seems plausible to argue that even though some government health expenditure is wasted, efforts to (for example) spread vaccines and improve primary care can have a significant payoff.

Whatever the role of government, literacy and vaccine programs surely helped only in combination with technologies that the skill of literacy or the vaccine programs helped to spread. These technologies, which appeared to have done little in increasing Third World income, have at least improved other measures of the quality of life. Given the role that global-

ization has been argued to play in transferring technology it may be that, along with government, globalization has been too quickly dismissed by some as a driver of development.

As a final thought, the results presented here may suggest lessons for the Millennium Development Goals for quality of life in developing countries. On a positive note, the MDG approach of moving beyond income measures as indicators of progress on development is strongly endorsed by the results presented here.

If income (and direct expenditure) is less relevant than commonly assumed for meeting quality of life targets, this also suggests that financial calculations regarding costs for improvements in the quality of life may be of limited utility, however. For example, quality of life convergence makes it possible to question the accuracy of exercises that ask "how much to meet the Millennium Development Goals." [34]—it may be that progress (at least on the nonincome dimensions) will be driven rapidly by convergence and less by transfers which may only be marginally related to quality of life outcomes (see Clemens, Kenny, & Moss, 2004).

NOTES

1. Ironically, given the subsequent performance of the United Kingdom in the 19th century (economic growth with stagnating life expectancy), the forecast was not so far off. "Diseases of the rich" are becoming almost as significant killers as "diseases of the poor" even in developing countries today. More people die each year in developing countries of high blood pressure, high cholesterol, obesity, physical inactivity, tobacco, alcohol and illicit drug consumption than die of malnutrition (iron, vitamin A, zinc, fruit and vegetable deficiency as well as underweight), unsafe water, sanitation and hygiene, and indoor smoke from solid fuels. The figures are 11.6 million deaths a year from these "diseases of the poor" compared to 12.6 million from "diseases of the rich." It should be noted that unsafe sex kills an additional 2.6 million people a year in developing countries (calculated from WHO, 2002), and that these figures exclude infant, maternal and infectious disease mortality, all of which disproportionately impact the poor.

2. See Islam (2003) for a recent review of the convergence literature. A keyword search on the Econlit database of economics research papers, books and articles returns 92 for "global income convergence" compared to 18 for "Millennium Development Goals," for example (http://www.econlit.org).

3. Not that this is a fair judgment even looking at divergence alone—African governments have only limited control over their countries' own rates of economic growth, and none over the rates of growth of wealthy countries.

4. Although see Hanmer, de Jong, Kurian, and Mooij (1999). The data used in this paper support Easterly over Hanmer *et al.* See also McGuire (2001), Easterlin (1995, 2000), Huck (1995), Szreter (1997) and McKeown and Record (1962).

5. See Nissan and Caveny (1988) on standardized measures of health and literacy 1960–80 (the result appears to be driven by their standardization method) and Easterlin (2000) on one measure of the strength of democratic institutions which suggests that over the period 1950–59 to 1990–94, developing countries have fallen further behind developed countries.

6. Philipson and Soares (2001) also note the strong convergence in life expectancy over 1962–97, and Becker, Philipson, and Soares (2003) note that based on this life expectancy convergence, "full" income measures that account for life expectancy are also converging worldwide.

7. Regarding other studies that have looked at this issue, Ram (1980, 1982) concentrates on the three variables of the physical quality of life index (PQLI), and—necessarily—covers a shorter period. Neumayer (2003) discusses only eight variables over the 1960–99 period alone, and Johnson (2000) only briefly discusses a limited number of health and nutritional variables.

8. Mean reversion may also produce biased results with a number of measures where indicators are bounded (in the case of political rights measures, for example, all readings are between 0 and 7), if mean reversion is measured in percentage terms.

9. We have results for the reverse "negative" complement as well, however, and the picture is unsurprisingly less encouraging than that for positive complements, as will be reported in later footnotes.

10. See Note 2.

11. A number of other measures of the shape and speed of convergence could be used—geometric or multiplicative means of positive or negative variables, odds ratios or measures of skewness. Given the data intensity of this paper using the already chosen measures, these techniques are left for later research.

12. A reviewer noted that there are in-country time series data for inequality in some quality of life indicators for some countries—including Brazil, China and India.

13. Some evidence for the "always different" viewpoint is provided by Sachs (2001). He cites a number of reasons why we should expect quality of life to be considerably lower in the tropics, and finds that infant mortality controlling for income is one half the level in temperate zones than it is in tropical zones, and life expectancy 8% higher (in 1995).

14. Correspondence with author, December 19, 2002.

15. At given dates, averages (and standard deviations) for life expectancy in the 19 countries are as follows: 1870, 38 (7); 1913, 48 (9); 1950, 66 (8); 1999, 76 (5). Data are from sources listed in Appendix Table 9. Similarly, Arriaga and Davis (1969) date declines in mortality (and mortality convergence) in Latin America to the 1920s and 1930s. A reviewer noted that life expectancy data are prone to severe measurement error, especially because perinatal mortality is poorly recorded across the world. Alternative measures (percentage survival of five year olds to age 50, for example) are not available for as many countries for as long a time scale, however.

16. AIDS is likely to cause life expectancy in sub-Saharan region as a whole to level off until 2010 (Easterlin, 2000). Ram (in correspondence with the author) notes that the picture for the 1990s would be far less positive. He notes that population-weighted inequality as measured by Bourguignon's "L" has grown from 0.0082 to 0.0098 over the course of the decade. This, he notes, despite continuing population-weighted income convergence over the course of the decade. While strengthening our argument on the weak link between income and quality of life convergence, this data do suggest that any optimism regarding the inevitable convergence of quality of life should be tempered.

17. For this sample, the maximum infant survival as a percentage of the minimum dropped from 133% in 1913 to 115% in 1950 (and to 108% in 1990). Data are from sources listed in Appendix Table 9.

18. As noted in an earlier footnote, "diseases of the rich," reflecting excessive consumption, are killing almost as many people even in developing countries than diseases of the poor based, among other things, on inadequate nutrition. A reviewer noted that we would not expect full convergence in nutrition intake, for example, because people in warm climates need to consume less food (see Neumayer, 2003).

19. In 1913, lead countries had reached universal literacy while the laggard (India) was still only 9% literate. By 1950, the minimum literacy recorded in this sample of countries had more than doubled, and was to again by 1999. Data from sources listed in Appendix Table 9.

20. At given dates, average primary enrollment as a percentage of the population (and standard deviations) for this sample are as follows: 1870, 8% (7%); 1913, 11% (6%); 1950, 12% (4%); 1990, 11% (4%). This suggests that convergence halted in the post-war period amongst the sample group—at least in terms of the unweighted coefficient of variation. It is likely that this is because of primary education reaching 100% of the target age group, combined with the beginnings of a demographic transition that lowered the percentage of the total population in the target age for primary education.

21. On a more serious note, this growing alcohol production will be behind the growing toll of mortality related to excess consumption—estimated to be responsible for approximately 1.8 million deaths per year worldwide (WHO, 2002). Along with probable convergence in indicators such as carbon dioxide output, this suggests that it is not only the "good" features of quality of life that are converging.

22. Thanks to one reviewer for pointing this out and suggesting that the Freedom House data were not the most suited for crosscountry and crosstime comparison. They suggested instead the use of the Gurr Polity data. Use of this data set suggests even stronger results. The Gurr "Polity 2" measure scores countries between −10 and 10, with −10 most autocratic and 10 most democratic. Over 1970–2002, for the 121 countries with data in both periods, the average score increased from −1.6 to 3.7, while the standard deviation fell from 7.4 to 6.5. Looking at the 71 countries with data for 1950, 1970 and 2002, average scores were 0.3, −0.6 and 5.5 while standard deviations were 7.4, 8.0 and 6.4, respectively. This suggests that while the 1970s did represent a low point in political freedom (as noted by Easterlin, 2000), the evidence still supports a "convergence" thesis compared to the mid-century level (calculated from data at http://www.cidcm.umd.edu/inscr/polity/index.htm).

23. We do have calculations regarding the "reverse measures" of infant mortality, undernourishment, illiteracy, lack of tertiary education, children in the labor force, political rights denied, civil rights denied and lack of water access. Compared to the results involving their complements reported in the text, the picture *is* far less positive. All eight see growing unweighted coefficients of variation (compared to but one of their complements), seven out of eight see growing weighted coefficients of variation (compared, again, to one out of eight of the "positive complements") and four out of eight see a positive relationship between initial values and subsequent growth (compared to none of the complements reported in the text). If positive complements were replaced with negative, over 60% of all variables would still suggest convergence using unweighted coefficients of variation.

24. Crafts (1997) notes that zero or negative economic growth accompanied improvements in life expectancy in a number of countries prior to the WWII including Korea, British Guyana, Cuba, the Philippines, Sri Lanka and Taiwan. Our data suggest the same is dramatically true for India 1913–50, where income fell but life expectancy climbed from 25 to 39 years.

25. Johansson and Mosk (1987) use universal primary education, a better public health program and a larger rural population to explain the fact that although Japan had an income one-fifth the United Kingdom's in 1900, life expectancy and infant mortality were almost exactly the same in the two countries. Primary education may take the majority of the credit. Female primary enrollment is in fact the *sole* cause of a relationship between rates of government social expenditure and increases in life expectancy, according to Ranis and Stewart (2001) (see also Hicks, 1982, and Sab & Smith, 2001—to add to the confusion there is also evidence that educational spending is weakly correlated with educational outcomes, as well—World Bank, 2000). Indeed, while there appear to be exceptions (see Hanmer & White, 1999a; Rosero-Bixby, 1986), Filmer, Hammer, and Pritchett (1997) note that there is little strong evidence to suggest that, in general, the presence or absence of public health clinics or levels of government expenditure on health has an impact on mortality. So, if there is a link between government expenditures and outcomes, it is not necessarily straightforward.

26. Rapid urbanization in the 1830s in the United States and the second half of the 18th century in Europe were accompanied by downturns in physical stature linked to exposure to increased disease and inadequate nutrition (Komlos, 1994). Only with breakthroughs in health technology linked to the validation of germ theory was the relationship between urbanization lower health significantly broken (see also Gangadharan & Valenzuela, 2001; Roberts, 1992). Compare the results of the negative impact of urban living on child mortality in 19th century Europe with the lack of a relationship in, for example Kenya in 1969 (Bradshaw, 1998), or the positive impact on infant mortality in China in 1981 (Bradshaw & Fraser, 1989).

27. Flegg's study of the determinants of infant mortality suggested that, once physicians and nurses per capita, illiteracy among adult women and inequality was accounted for, income had no independent effect at the cross-country level on infant mortality rates.

28. Inequality has also been found to positively correlate with the death rate from political violence, negatively correlate with measures of democracy and educational attainment and positively correlate (unlike absolute income measures) with national crime rates for example (Thorbecke & Charumilind, 2002; see also Gradstein & Milanovic, 2002). Esposto and Zaleski (1999) further find that increases in a measure they construct of "economic freedom" is linked to increases in life expectancy and literacy.

29. The positive impact of income equality on various other indicators suggests that unequal growth might actually have a negative impact on the quality of life of countries even if it involves no absolute decline in incomes for any group within the country.

30. One reviewer questioned the broad sense of failure regarding development outcomes. Whether the broad sentiment is one of success or failure is of course difficult to answer conclusively, but I would point to the fact that a search of the proquest newspaper collections for the words "international development" and "failure" found 33 articles, compared to 34 articles for "international development" and "success"—suggesting, at least, there is a community of development pessimists (data from www.proquest.com). See also Sender (1999), quoted earlier, who discusses images of Africa's failure.

31. As Easterlin (1981) notes about education rates, countries that remained comparatively free of colonial influence (Turkey, Iran, China, Ethiopia) do not see particularly better performances than countries that were colonized (Egypt, India, Nigeria).

32. As time progresses, the evidence presented in this paper suggests that that the income needed to meet "basic needs" is dropping, not rising.

33. The reverse relationship also takes somewhat of a bruising from the evidence presented here. If health and education really were the driving force behind income growth, given how long they have been converging, it is awfully surprising income has not started converging, too.

34. For example, Devarajan (2001) notes that "Growth is Not Enough" to meet the MDGs, based on income elasticities of improvements in quality of life garnered from crosscountry studies. These elasticities almost certainly underestimate the progress that will be made because of convergence regardless of income change.

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APPENDIX A. APPENDIX TABLES 9–13

Table 9[a]

Indicator	Description and source
GDP/capita	1990 international dollars GDP/capita from Maddison (1995), Crafts (2000) and World Bank (2002)[b]
Life (Crafts)	Life expectancy at birth from Crafts (2000), Maddison (2001), Arriaga and Davis (1969), Preston (1975), and World Bank (2002)[c]
Infant survival % (Mitchell)	Infant survival per 1,000 live births from Mitchell (1998), Bairoch (1988), and World Bank (2002)[d]
Nourished %	Nutrition, nourished as % of total population from United Nations (2002)
Calories/capita	Average daily calorie intake from Easterly (1999)
Primary %	Primary school students as a percentage of total population. Education data from Mitchell (1998), population data from Maddison (2001)[e]
Literacy % (Crafts)	Literacy rate, adult total from Crafts (2000) and World Bank (2002)[f]
Tertiary %	School enrollment, tertiary (% gross) from World Bank (2002)
Total education/capita	Average total years of education in population from Barro and Lee (2000)
Equality	One minus Gini index, average of decade values from Easterly (1999)
Female/male literacy	Female literacy as a percentage of male literacy, from data in World Bank (2002)
Children not in labor %	Not in labor force, children 10–14 (% of age group) from United Nations (2002)[g]
War deaths/capita	War deaths per capita, from Easterly (1999)
Beer/capita	Beer production per capita (hectolitres), beer data from Mitchell (1998), population data from Maddison (2001)[h]
Inflation %	Inflation, consumer prices (annual %) from World Bank (2002)
Political rights	Political rights scored on a scale of 1–7 with 7 as highest and 1 as lowest, from Freedom House (2002)
Civil rights	Civil rights scored on a scale of 1–7 with 7 as highest and 1 as lowest, from Freedom House (2002)
Water access %	Improved water source (% of population with access) from World Bank (2002)
Electric power/capita	Electric power consumption (kWh per capita) from World Bank (2002)
Cars/capita	Passenger cars (per 1,000 people) from World Bank (2002)
Radios/capita	Radios (per 1,000 people) from World Bank (2002)
Telephones/capita	Telephone mainlines (per 1,000 people) from World Bank (2002)

[a] Population data used to create per capita figures and weightings for the Crafts and Mitchell variables comes from Maddison (2001) (except Cyprus from UN), and from the United Nations (2002) for 1950 in the case of Nutrition.
[b] 1990 and prior data are all based on Maddison (1995), some reported in Crafts (2000). 1999 data are estimated using real LCU GDP/capita growth rates 1990–99 from World Bank (2002).
[c] Data from Crafts (2000) except Maddison (2001) for 1820, Arriaga and Davis (1969) for Brazil, Costa Rica and India 1870 data, Preston (1975) for 1930–40 data and World Bank (2002) for 1990 and 1999 data.
[d] Data from Mitchell (1998) except Bairoch (1988) for Egypt 1914 (an average of Cairo and Alexandria), also 1950 Brazil, Indonesia Tunisia and India, and World Bank (2002) for all 1990 and 1999 data. Data for two years prior or two years after used if year data not available. United Kingdom figures are for England and Wales, Germany figures during partition for West Germany.
[e] Data from five years either side allowed, for some early developing country data, total education rather than just primary education enrollment is used. 1913 Hungary statistics removed.
[f] Data all from Crafts (2000) except World Bank (2002) for 1990 and 1999 data. Literacy in OECD and Czech Rep 1990 and 1999 assumed to be 100%.
[g] Estimates and projections for all countries created by ILO.
[h] Data from five years either side allowed.

Table 10

	Start	End	Number of countries	Coverage % world
GDP/capita	1950	1999	73	84
Life (Crafts)	1950	1999	77	87
Infant survival % (Mitchell)	1950	1990	48	53
Nourished %	1979	1998	87	68
Calories/capita	1970	1990	151	90
Primary %	1950	1990	61	73
Literacy % (Crafts)	1950	1999	76	87
Tertiary %	1970	1997	122	87
Total education/capita	1960	1985	95	61
Equality	1960	1990	45	48
Female/male literacy	1970	2000	131	81
Children not in labor %	1960	2000	169	100
War deaths/capita	1960	1990	161	91
Beer/capita	1950	1990	48	57
Inflation %	1965–69	1995–99	91	58
Political rights	1972	2002	156	95
Civil rights	1972	2002	156	95
Water access %	1990	2000	72	75
Electric power/capita	1971	1999	107	89
Cars/capita	1978–81	1996	72	53
Radios/capita	1970	1997	168	94
Telephones/capita	1960	2000	101	58

Table 11

	Average		Standard deviation		Coefficient of variation	
	Start	End	Start	End	Start	End
GDP/capita	2,692	8,879	2,302	7,524	0.85	0.85
Life (Crafts)	54	69	12	10	0.22	0.15
Infant survival % (Mitchell)	924	978	37	20	0.04	0.02
Nourished %	74	75	16	17	0.21	0.23
Calories/capita	2,450	2,635	459	524	0.19	0.20
Primary %	0.10	0.13	0.04	0.04	0.45	0.35
Literacy % (Crafts)	60	87	32	16	0.53	0.18
Tertiary %	6	21	8	21	1.32	0.99
Total education/capita	3	5	2	3	0.74	0.53
Equality	66	71	11	10	0.17	0.14
Female/male literacy	66	85	30	18	0.45	0.21
Children not in labor %	80	90	18	14	0.23	0.16
War deaths/capita	86	470	302	1,951	3.51	4.15
Beer/capita	0.25	0.60	0.32	0.51	1.28	0.85
Inflation %	9	15	36	49	4.06	3.21
Political rights	3.66	4.56	2.22	2.16	0.61	0.47
Civil rights	3.83	4.37	1.98	1.82	0.52	0.42
Water access %	74	79	21	20	0.28	0.25
Electric power/capita	1,396	3,589	2,189	4,688	1.57	1.31
Cars/capita	109	154	137	170	1.26	1.10
Radios/capita	223	431	232	355	1.04	0.82
Telephones/capita	35	242	62	237	1.76	0.98

Table 12

	Weighted average		Weighted standard deviation		Weighted coefficient of variation	
	Start	End	Start	End	Start	End
GDP/capita	2,263	6,575	2,789	7,508	1.23	1.14
Life (Crafts)	51	69	13	7	0.26	0.11
Infant survival % (Mitchell)	904	953	43	33	0.05	0.03
Nourished %	70	82	11	13	0.16	0.16
Calories/capita	2,375	2,675	527	392	0.22	0.15
Primary %	0.06	0.09	0.05	0.07	0.85	0.71
Literacy % (Crafts)	52	81	38	17	0.73	0.22
Tertiary %	8	18	13	23	1.66	1.26
Total education/capita	4	5	3	3	0.81	0.62
Equality	61	64	8	8	0.13	0.13
Female/male literacy	59	80	25	16	0.42	0.19
Children not in labor %	76	90	18	10	0.24	0.11
War deaths/capita	126	80	352	644	2.80	8.00
Beer/capita	0.19	0.37	0.29	0.45	1.52	1.22
Inflation %	24	17	79	55	3.34	3.22
Political rights	3.72	4.14	2.50	2.43	0.67	0.59
Civil rights	3.51	3.96	2.27	1.77	0.65	0.45
Water access %	76	81	15	15	0.20	0.18
Electric power/capita	1,102	2,039	2,124	3,449	1.93	1.69
Cars/capita	126	142	188	202	1.49	1.43
Radios/capita	228	420	367	496	1.61	1.18
Telephones/capita	51	195	91	262	1.80	1.34

Table 13

	Bottom 20% divided by top 20%		Correlation % growth to start	Correlation absolute growth to start
	Start	End		
GDP/capita	0.097	0.070	−0.15	
Life (Crafts)	0.541	0.654	−0.71	
Infant survival % (Mitchell)	0.226	1.052	−0.85	−0.84
Nourished %	0.528	0.506	−0.51	−0.41
Calories/capita	0.599	0.579	−0.62	
Primary %	0.207	0.339	−0.38	−0.65
Literacy % (Crafts)	0.126	0.591	−0.66	−0.91
Tertiary %	0.010	0.020	−0.22	0.61
Total education/capita	0.084	0.184	−0.47	
Equality	0.479	0.504	−0.44	−0.50
Female/male literacy	0.243	0.548	−0.86	−0.88
Children not in labor %	0.519	0.659	−0.74	−0.70
War deaths/capita			−0.22	
Beer/capita	0.010	0.048	−0.12	
Inflation %	0.030	0.019	−0.08	−0.56
Political rights	0.000	0.091	−0.53	−0.49
Civil rights	0.087	0.141	−0.55	−0.53

Table 13—*continued*

	Bottom 20% divided by top 20%		Correlation % growth to start	Correlation absolute growth to start
	Start	End		
Water access %	0.431	0.471	−0.55	−0.40
Electric power/capita	0.008	0.010	−0.11	
Cars/capita	0.009	0.009	−0.18	
Radios/capita	0.039	0.088	−0.40	
Telephones/capita	0.003	0.008	−0.26	