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Life During Growth

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Abstract: A remarkable diversity of indicators shows quality of life across nations to be positively associated with per capita income. At the same time, the *changes* in quality of life as income *grows* are surprisingly uneven. Either in levels or changes, moreover, the effect of exogenous shifts over time is surprisingly strong compared to growth effects. This paper reaches this conclusion with a panel dataset of 81 indicators covering up to 4 time periods (1960, 1970, 1980, and 1990). The indicators cover 7 subjects: (1) individual rights and democracy, (2) political instability and war, (3) education, (4) health, (5) transport and communications, (6) inequality across class and gender, and (7) "bads." With a SUR estimator in levels, income per capita has an impact on the quality of life that is significant, positive, and more important than exogenous shifts for 32 out of 81 indicators. With a fixed effects estimator, growth has an impact on the quality of life that is significant, positive, and more important than exogenous shifts for 10 out of 81 indicators. With a first-differences IV estimator, growth has a causal impact on the quality of life that is significant, positive, and more important than exogenous shifts for 6 out of 69 quality of life indicators. The conclusion speculates about such explanations for the pattern of results as: (1) the long and variable lags that may come between growth and changes in the quality of life, and (2) the possibility that global socioeconomic progress is more important than home country growth for many quality of life indicators.

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I. Introduction

Does life during growth get better? Scholars differ.

Scholars in the new growth literature have generally found the answer to be yes. Barro [1996, 1997] finds quality of life indicators like civil liberties and democracy to be positive functions of per capita income across countries. Barro and Sala-i-Martin 1995 likewise find per capita income positively associated with two measures of health: infant mortality and life expectancy.[1] Barro and Lee 1997 find that per capita income is significant in a regression for the schooling outcomes of test scores, repetition, and dropout rates. Pritchett and Summers 1995 find that "wealthier is healthier," i.e. that higher income causally lowers infant mortality. Grossman and Krueger 1993 find that higher income eventually lowers pollution. Boone 1996 shows that political, gender, and ethnic oppression decline as one goes from poorer to richer countries. Mauro 1993 finds a strong relationship between per capita income and an average of indices of red tape, inefficient judiciary, and corruption. Clague, Keefer, Knack, and Olson 1996 likewise establish a relationship between high per capita income and high quality institutions -- freedom from expropriation, freedom from contract repudiation, freedom from corruption, and rule of law. Keefer and Knack 1997 find a strong association between per capita income and trust between individuals in a society.

All of this literature has featured cross-national associations. However, if there are country fixed factors, then these fixed factors may drive a spurious correlation between income and the "life" indicator. There is no shortage of fixed factors in the new growth literature. Hall and Jones (1997, 1998) suggest distance from the equator and use of a European language as instruments for "social infrastructure" measured by openness and institutions, which in turn is an explanatory variable for productivity. Sachs and Warner [1995, 1997] have suggested a country's access to the sea, natural resource abundance, and tropical location as fixed, explanatory variables for income. Easterly and Levine 1997 point to ethnolinguistic fragmentation as a fixed factor

holding back Africa's economy. Another quasi-fixed factor affecting the economy could be the legal system **(**see La Porta, Lopez-de-Silanes, Shleifer, and Vishny 1998a**).** These fixed factors may also affect the "life" indicators -- for example, Filmer and Pritchett 1997 found that ethnolinguistic fractionalization increased infant mortality and La Porta, Lopez-de-Silanes, Shleifer, and Vishny 1998b find that tropical location, ethnic heterogeneity, religion, and legal origin affect the quality of government services.

The recent growth literature did not of course start the study of life during growth. Early development economists were optimistic about how growth would improve a wide range of health and education indicators. Political scientists went even further to include political development (democracy and much more) as a correlate of economic development. Huntington 1968 (p. 32) saw a process of "modernization" that was "a multifaceted process involving changes in all areas of human thought and activity." The assumption, as Huntington recalled later, was that "all good things go together."[2]

The second generation of development economists and political scientists fiercely challenged these conclusions. One prominent social scientist proclaimed "modernization: RIP."[3] According to the leading development textbook of Todaro 1997:

> The experience of the 1950s and 1960s, when a large number of Third World nations did achieve the overall UN growth targets but the levels of living of the masses of people remained for the most part unchanged, signaled that something was very wrong with this narrow definition of development {per capita GNP}.

These sentiments have made their way into commentaries on development by many international organizations and commissions.[4] The usual concern, as expressed above, is that income distribution worsens during growth sufficiently that the poor majority experience no rise in income. The dissatisfaction with GDP as an indicator of well-being led Morris (1979) to propose an alternative indicator to GDP called the Physical Quality of Life Index (PQLI). The PQLI was an unweighted index of literacy, infant mortality, and life expectancy. Morris' proposal was

widely adopted (the United Nations Development Program now uses a modified version called the Human Development Indicator).

However, development economists looking at cross-section data about income per capita and the quality of life in developing countries found evidence more in line with the earlier optimism. Studies such as Wheeler 1980, Ram 1985, Dasgupta and Weale 1992, Dasgupta 1993, Kakwani 1993, Sen 1994, and Klitgaard and Fedderke 1998 generally found quality of life indicators to be higher in richer nations. But again these authors usually estimated the relationship across nations.

The economic history literature contains virtually the only studies looking at life during growth across time rather than across countries. It finds surprisingly mixed changes in quality of life as per capita income increased. While many standard indicators like school enrollment and infant mortality improved steadily with rising income, there are contrarian episodes for other indicators. For example, US life expectancy declined from about 1790 to about 1840, a time of robust per capita growth. Nutrition also advanced unevenly, as American nutrition (as measured by stature) deteriorated from about 1830 to 1880 despite rising income (Fogel 1990). Conversely, life expectancy rose by 4 years during the Great Depression of the 1930s (Fogel 1994). More subjectively, there is the "Easterlin paradox" that surveys of self-reported happiness do not show increasing happiness as per capita income rises over time within a given country (Easterlin 1996).

A debate about contrarian trends in living conditions during English industrialization dates back to Engels' denunciation of the "dark Satanic mills" as "social murder." Pessimists like Thompson (1975) believe that urban quality of life got worse from the late 18th to the mid 19th centuries. Optimists like Lindert and Williamson 1983 concede that English real wages were stagnant during early industrialization from 1755 to 1810, but they show that real wages doubled from 1810 to 1851. Infant mortality also declined everywhere in England from 1841 to 1906 (Williamson 1982). On the other hand, crime, social unrest, and illegitimacy were apparently

rising during British industrialization (Lindert and Williamson 1983). Polak and Williamson 1991 document how capital stock per capita in public works fell by 6 percent from 1760 to 1830, while nonresidential private capital was rising by 29 percent.

The economic history literature has also documented long lags between rising per capita income and improved quality of life. Morris 1995 studied three episodes of rapid capitalist development and concluded that four to five decades passed before the majority of the population got "delivery of the goods." Fogel 1994 believes that the gain in nutrition in OECD countries between 1910 and 1980 "was due to a series of investments made as much as a century earlier."

Authors in the "growth," "development," and "history" literatures have designed their quality of life studies well to answer many important questions. But the question of this paper -- does life during growth get better? -- still needs further examination. First, the previous literature has concentrated only on a small range of indicators (with the important exception of Fedderke and Klitgaard 1998). Second, the cross-section studies usually focus on the partial relationship between per capita income and any given individual indicator, holding other factors constant. This is perfectly appropriate for many purposes, but it does not address the question of this paper when virtually all other factors are themselves plausibly endogenous to income. Finally, as already noted, the literature on recent data (with some exceptions) has emphasized only cross-section associations between quality of life indicators and per capita income.[5] The possibility of country fixed factors suggests that econometric methods that control for fixed factors -- fixed effects and first differences – should also be applied, even though the information from the cross-section results remains of interest.

II. Data collection and methodology

This section describes how I selected and organized the data series.

1. Description of data collection and organization

I used two criteria to select indicators. The first criterion was that indicators should unambiguously affect the quality of life. The majority of readers should agree on which direction of change in the indicator is "good." The second criterion was that each indicator should have some public good aspect. Even the worst doubters about growth accept that a private individual will purchase more private goods as his/her income rises; the effect of rising income on publicly provided goods is less clear. While private goods will have their own effect on quality of life, I focus on the collective quality of life. Data sources are listed in Appendix 1.[6]

Data span the years 1960, 1970, 1980, and 1990. For data series that were available only at irregularly spaced intervals, I used the average of any data available in the decade subsequent to the initial decade year. Data that were available at a single point in the decade other than the decade year I assigned to the closest decade year (Appendix 1 lists these cases). The income per capita data, from Summers and Heston 1993 (version 5.6), is always for the beginning of the decade. The final data set includes 81 indicators of the quality of life in seven areas: (1) individual rights and democracy, (2) political instability and war, (3) education, (4) health, (5) transport and communications, (6) inequality across class and gender, and (7) "bads.".

2. Methodology

I thus have a panel data set for each indicator of quality of life and income. Allowing for fixed time and country effects, I have:

(1) $L_{it} = \lambda_t + \mu_i + \beta y_{it} + \varepsilon_{it}$

where i indexes countries and t indexes time (1960, 1970, 1980, 1990 -- but note that one of the time period effects has to be omitted). y_{it} is the log of per capita income. The quality of life indicator L_{it} I will allow to be either log or linear in this and the following equation, depending on which gives a better statistical fit (determined on the basis of the absolute value of the t-statistic) with respect to y_{it}. Also if an increase in the indicator I am using means worse quality of life, then

I take the negative of the variable (or of its log). Hence, a positive β always means that higher income improves quality of life. I am testing a simple H_1 -- on average a given indicator of quality of life gets better during growth, or on average it gets worse -- against the H_0 of zero change (β=0). I will later investigate the possibility of nonlinearities in the relationship.

I will use three estimation methods to estimate (1). First, I assume a common country intercept (all $\mu_i = \mu$) and estimate (1) using the method of seemingly unrelated regressions (SUR) across decades. This method uses both the cross-section and time series variation to make inferences about β. Second, I estimate (1) directly by the method of fixed effects. This method removes all cross-section variation and leaves only the time variation (as differenced from the global time shifts represented by the λ_t).[7] Neither SUR nor fixed effects address the problem of possible reverse causality from quality of life to income. Indeed many of the indicators used here have been used as determinants of income growth in the growth regression literature (e.g. education and infrastructure). To address causality, I use a third method.

The third method is to take first differences of (1) to get:

(2) $L_{it} - L_{it-1} = \lambda_t - \lambda_{t-1} + \beta(y_{it} - y_{it-1}) + \varepsilon_{it} - \varepsilon_{it-1}$

Formulation (2), which also removes the country fixed effect, has advantages and disadvantages compared to the fixed effects formulation (1). (However, note that these two methods are numerically equivalent when there are only two time periods.) The most important advantage of (2) is that it makes possible to correct for the possible endogeneity of y in (1). Instruments for y that are exogenous and excludable from an L equation are hard to come by, but the lagged value of y is always one popular candidate. As is well known, the lagged value of y is invalid as an instrument in (1) because it is correlated with the error term. This is not a problem in (2) if y_{it-2} is used as the instrument (Griliches and Hausman 1986, p. 102). The appropriately lagged growth rate of y could also be used, but the literature has found the appropriately lagged level of y to outperform the growth rate (Baltagi 1995, p. 126). The empirical growth literature has found a

number of policy determinants of growth, which are also available for use as instruments in (2). I am going to use three familiar variables from the empirical growth literature -- the black market premium, financial depth, and inflation.[8] Note that the first-stage regression is much like the cross-country regressions usually run in the growth literature, which feature initial income and policies (cf. Barro and Sala-I-Martin 1995).

The disadvantage of first differences is that the properties of the fixed effects estimator are better if y is exogenous and the error term is stationary (Griliches and Hausman 1986). The first differences IV estimator may also have low power if the instruments for growth are less than ideal. Hence, I will show both sets of estimates keeping in mind that the different estimators will be appropriate under different circumstances and assumptions.

Note that all estimation methods give estimates of the shift over time in the intercept λ_t. I will calculate this as annualized "exogenous change". If L_{it} is in logs and we have data from 1960 to 1990, then the "exogenous change" is simply $(\lambda_t - \lambda_{t-3})/30$. Using the coefficient on log per capita income from each regression and the world average log growth rate of .0195, I calculate an analogous annualized "growth effect" $.0195*\beta$. When L is linear, then I will divide the change by the mean in the initial period.

III. Results of SUR method in levels

Table 1 shows that 61 out of the 81 indicators display significant and positive effects of income on the quality of life in levels, often with positive double-digit t-statistics (remember that I take the minus of any variable where an increase indicates worse quality of life).

Rich countries compared to poor countries have more democracy, less corruption, less expropriation of property, more contract-keeping by governments, more rule of law, and higher bureaucratic quality. Rich countries compared to poor countries have more civil liberties, less abuse of human rights, less use of child labor, more political rights, and more independence of politics from the military. Rich countries compared to poor countries have fewer coups, cabinet

changes, and revolutions, less likelihood of civil or international war and less war deaths per capita, less racial tension, and less separatism. [9] Rich countries compared to poor countries have more museums, more average years of schooling, higher schooling enrollment ratios at all levels, less illiteracy, less people with no schooling, and more book titles published per capita. Rich countries compared to poor countries have greater life expectancy, fewer babies dying, less children under 5 dying, more calorie and protein intake, more doctors, hospital beds, and nurses. Rich countries compared to poor countries have more roads paved, more telegrams, telexes, telephones, fax machines, radios, and TVs, fewer households without a toilet or clean drinking water (including both rural and urban). Rich countries compared to poor countries have less inequality between rich and poor, a smaller gap between men and women's literacy, a smaller gap between male and female enrollment ratios at all levels. Rich countries compared to poor countries have less destruction of forest area, and less smoke in the air. The diversity of indicators shown here to be positively associated with per capita income is greater than in any previous study.

On the negative side, the "bads", true to their name, show a negative effect of income on the quality of life in eleven indicators. Some indicators of pollution, some crimes, injuries in the workplace, and suicides get worse with higher income.[10] Also road length per car (an indicator of congestion of the road network) decreases with per capita income. So 12 of 81 indicators indicate worsening quality of life with higher income. Only 8 of the 81 indicators of quality of life fail to show a significant relationship with income, either positive or negative. These results indicate very strong relationships between income and quality of life, which may either reflect a long run causal relationship between income and quality of life, some reverse causality from quality of life to income, or omitted fixed factors determining both income and life.

Although the income effects are strong, so is the exogenous time trend in many of the quality of life indicators. Of the 61 quality of life indicators that show significant improvement

with growth, only 32 of them show a growth effect (at world mean growth) that is greater than the exogenous improvement over time. Of the 12 indicators that showed a significant deterioration with higher income, 11 of them have a positive exogenous improvement that partially offsets the negative effects of higher income. These findings suggest that the previous literature, by focusing on cross-section samples, overlooked the important role of exogenous global improvements in quality of life indicators regardless of country incomes.

IV. Results controlling for country effects

Controlling for country effects has advantages and disadvantages. On one hand, it removes any spurious correlation between income and quality of life that a third omitted factor may have caused. On the other hand, sweeping out all the cross-section variation reduces the range of variation of income and of the social indicators. Given that there is likely to be noise from measurement error, this makes it harder to detect income effects on social indicators. If the effects of income on quality of life occur with a long and variable lag, the results will be strong in levels but weak controlling for country effects. I will argue that both the SUR levels results and the results controlling for country effects should be taken seriously for a full picture of how the quality of life evolves during growth.

I organize the results controlling for country effects by topic; each topic will have one section in Table 2 and sometimes a graph. The sections show the statistics for each indicator and for each estimation method. The patterns to look for are simply whether the relationship between income and the quality of life indicator is significantly positive. At the end of this section, I will do an overview of the patterns of significance of indicators.

1. Individual rights and democracy

Controlling for country effects, income coefficients for two democracy and rights indicators are significant and positive in both the fixed effects and first differences-IV regressions: child labor and government contract-keeping (Table 2). (Recall that I have changed

signs so that an increase in the variable always reflects improved quality of life.) One of the institutional quality variables -- freedom from corruption -- have a significant and *negative* relationship with income in both the fixed effects and first differences-IV results. The correlations between income and civil liberties, political rights, and human rights do not show up here as significant when the country fixed effects are removed.

Figure 1a shows the significant relationship in a scatter of the Humana human rights index in levels against income. Figure 1b shows the non-relationship in deviations from time and country averages. I will use here and in the following indicators a smoothing device to visually inspect the data. I order the sample for indicator L by income. I calculate the average of indicator L for the poorest 30 observations and the average of income for that same group, and plot that point on a scatter diagram of indicator L against income. Then I move one observation and plot the average of the group of observations 2 to 31 ordered by income. I keep doing this to get a continuous stream of points until I get to the top 30 observations. Figure 1c shows the smoothed data. Figures 1b and 1d show the unsmoothed and smoothed deviations from time and country averages. This smoothing device is simply a moving average of 30 observations ordered by income rather than by time. It closely resembles what the nonparametric literature calls a "k-nearest neighbor estimator" of the typical y for a given x (see, for example, p. 42ff, Hardle 1990).)[11] The dotted lines show the 2-standard deviation ranges for the means. I choose the scale of the vertical axis of each graph to show the conceivable maximum and minimum that the dependent variable could reach, unconditioned by income, in groups of 30 observations.[12] This helps us see how much y spans the range of variation of L. If the countries with the best (worst) y are also the countries with the best (worst) L, then the heavy black line will hit the corners of the box in each graph. Figure 1c shows the strong relationship in the smoothed data in levels. Figure 1d shows the lack of relationship in smoothed data in deviations.

2. Political instability and war

None of the political instability or war measures are significant in both the fixed effects and first differences-IV regressions (Table 2). In the fixed effect regressions, coups, revolutions, and war deaths significantly improve with income.[13] Absentees from a significant relationship with income in fixed effects include racial tensions and prevalence of separatist movements, which were strongly related to income in levels (see Table 1). Figure 2b with smoothed data shows, for example, how little evidence there is for a relationship over time between income and freedom from racial tensions after removing country effects, while figure 2a shows the strong levels relationship.

3. Education

The relationship of education to income across countries has been firmly established in the cross-section literature (as well as here in Table 1). However, none of the education variables are positively and significantly related to income in both the fixed effects and first differences – IV regressions(Table 2). Primary enrollment is actually *negatively* and significantly related to income using both methods. (Pritchett (1997) shows a similar negative correlation in first differences for enrollment ratios and income, although he is looking at income growth as the dependent variable). The positive effects of income on average schooling years for the population, college enrollment, and secondary enrollment do hold up under fixed effects.

Figures 3a and 3b illustrate again how different are the cross-section and the cross-time results, in this case for literacy. Figure 3a shows the indisputable relationship between income and literacy in the pooled cross-section, cross-time sample. Figure 3b shows the lack of relationship in first differences. Recall that the range of values along the vertical axis represents the maximum and minimum of the dependent variable. Figure 3b shows how none of this variation is explained, in contrast to the levels chart where almost all the variation is explained.

To anticipate results on exogenous changes in social indicators, figure 3b also shows that the growth in literacy was positive regardless of the growth rate of income.

4. Health

There are widely known relationships across countries between income and health indicators such as infant mortality, under-5 mortality, and life expectancy, and many more (see Table 1 again). Here, infant mortality, calorie intake, and protein intake are significantly and positively related to income in both fixed effects and first differences – IV regressions.[14]

However, life expectancy's relation to income is not positive and significant under either fixed effects or first differences IV (see Table 2). Other variables simply are insignificant under both methods, such as access to sanitation. Access to clean drinking water is also insignificantly related to income under fixed effects. Hospital beds per capita, doctors per capita, and nurses per capita are positively and significantly related to income under fixed effects, but not under first differences – IV.

A monotonically negative relationship of infant mortality to income is strong in deviations from time and country averages. The magnitude of the coefficient in fixed effects is in the range that Filmer and Pritchett 1997 identified as common to most studies. Pritchett and Summers 1996 present evidence that there is a causal relationship from income to infant mortality. The first-differences IV results here confirm this finding.

5. Transport and communications

One would expect transport and communications (railroads, telegrams, telexes, telephones, radios, TVs, faxes, percent roads paved) to go up strongly with income. Some of these expectations are fulfilled. Such harbingers of civilization as telephones, telegrams, and TVs are significantly positively related to income under both fixed effects and first differences IV (Table 2). Although these are private rather than public goods, they are indicators of the degree to which the government has invested in the public good of communications infrastructure.

Other relationships are more problematic. Romer 1990 treated radios in the cross section as a variable so tightly linked to income that it could be used as an instrument for income measured with error. Radios are positively and significantly related to income under fixed effects, but negatively and significantly related to income under first differences.

Another notable absentee from the results is the percent of roads that are paved. In contrast, the road length per car significantly declines according to the fixed effects estimator, as it did in the levels regression (see Table 2).

6. Inequality across class and gender

The relation of inequality to income per capita has been intensively studied with a vast literature seeking to confirm or reject the Kuznets curve. (For recent references, see Deininger and Squire 1996 -- the source of my data here -- and Anand and Kanbur 1989). None of the inequality indicators here are significant under both fixed effects and first differences IV. The income share of the bottom quintile is positively related to income under first differences –IV, but is of the opposite sign and insignificant under fixed effects. These non-results on income inequality and income echo similar findings by Deininger and Squire 1996.[15] These results could be seen as good news, because they contradict the fears of critics on the left that income distribution would significantly worsen during growth.

As far as gender equality under fixed effects, female to male primary enrollment is significant with the "wrong" sign with respect to income. Female to male secondary enrollment is significant with the "right" sign. None of the gender equality measures are robust to the use of the first differences IV estimator. Figures 4a and 4b show the absence of a relationship between the female to male literacy ratio and income in first differences (4b), in contrast to the strong relationship in levels (4a).

7. "Bads"

"Bads" are indicators that many consider a priori to be unwanted byproducts of higher incomes. This section considers two principle types of "bads": crime and the environment, as well as some miscellaneous ones. Although the data on these indicators is poor, the strong interest in them in the literature warrants some attempt to detect a relationship with income.

The relationship between crime and income is very weak in the fixed effects. The serious problem of variation in reporting (in the UN Crime Survey) does not help this weak relationship. The only crime to be significantly related to income (it worsens, in fixed effects) is manslaughter (Table 2).[16] I could interpret these weak results as good news if my prior was that crime worsened with rising income. None of the crime indicators are significant under first differences IV.

The literature on per capita income and the other prominent "bad"-- pollution -- is already extensive (see Grossman and Krueger 1993, Holtz-Eakin and Selden 1995, and Shafik 1995 for important contributions). Here both the fixed effects and first-differences estimation shows that the carbon emissions indicators (carbon dioxide and industrial carbon dioxide) and waste paper production tend to get worse with income

The strong link between emissions and income here and elsewhere in the literature may in part be an artifact of the way the source constructs emissions data.[17] However derived, the positive and significant coefficients on income for emissions of CO2 and industrial CO2 match other results in the literature. Holtz-Eakin and Selden 1995 found a significant coefficient with an IV fixed effects estimator on CO2.[18]

Grossman and Krueger 1993 used measures of ambient air quality instead of emissions data. Unfortunately, the other ambient air quality measures and water quality measures that Grossman and Krueger used did not have sufficient time or cross-section dimension for use in the present study. However, there is one direct Grossman-Krueger measure of air quality with sufficient data -- suspended particulate matter -- but it is not significantly related to income with

the fixed effects estimator. The annual change in forest area is likewise unrelated to income. Finally, two very dissimilar "bads" – suicide and work injuries – are not significantly related to income.[19]

8. Stock-Taking

How can we make sense of the large mass of material presented in Tables 1 and 2? There is the good news that such core development indicators as child labor, infant mortality, nutritional intake, and communications infrastructure are robustly related to income across countries and in both fixed effects or first differences. The bad news is that other key modernization or development indicators like democracy, good institutions, human rights, years of schooling, school enrollment ratios, and life expectancy do not robustly improve with income controlling for country effects and sometimes even have the wrong sign. Additional bad news is the robust association of "bads" like CO2 emissions and waste paper production with growth.

One primitive means of summarizing the results is simply to count the number of indicators where growth significantly betters welfare out of the total set of diverse indicators. This is imperfect, since I can hardly assert that the indicators are independent Bernoulli trials of some abstract quality of life concept. Still no alternative summary device is available. I will use this one while reminding the readers it is preferable that they examine all of the information in tables 1 and 2.

For the fixed effects estimator applied to 81 indicators, the coefficient of income was significant at the 5% level for 34 indicators. Of these 34, 20 of them show improvement in the quality of life associated with rising income. Fourteen indicators show significant deterioration in quality of life as income rises. If we take the shortcut of regarding these as independent trials of quality of life, we cannot reject the hypothesis that quality of life is equally likely to improve or worsen with rising income (20 of 34 is not significantly greater than 50%).

The fixed effects estimator is appropriate if we simply want to chart the joint evolution of income and "life," or to discuss causal determination of "life" if income is exogenous. If income is endogenous and we want to address causality, the first-differences IV estimator should be used. Of the 69 indicators to which I applied this method[20], income significantly affected 14 of them. Six indicators of the quality of life significantly worsened with rising income -- corruption, primary enrollment, radios, total CO_2 emissions, industrial CO_2 emissions, and waste paper production. Eight out of the 69 indicators – government not breaking contracts, child labor, calorie intake, protein intake, infant mortality, telephones, telegrams, and the share of the bottom income quintile -- significantly improved with rising income. Again, we find that quality of life is about equally likely to improve or worsen with rising income.

Although many of the associations between income and "life" in the SUR levels sample are not robust to the use of fixed effects or first difference IV methods, I do not believe this warrants discarding the SUR results. The SUR results in levels may still be capturing a long run relationship between income (which is after all the sum of all past growth) and "life" (which is the sum of all past social improvements). The weaker fixed effects and first differences IV results may be reflecting the lack of a shorter-run contemporaneous relationship between income and measured indicators of the quality of life.

9. Exogenous Changes in Quality of Life Indicators

I noted in section II that the estimation of separate time intercepts allows me to calculate the "exogenous" change in each indicator. "Exogenous change" is the change in the indicator over time holding income constant. (I put "exogenous" in quotes because these time shifts may represent endogenous global innovation and may be a function of the global growth rate.) Likewise, I can calculate the movement along the estimated indicator-income curve and derive the "growth" contribution to the change over time in the indicator. I annualize in percent both the "exogenous change" and the "growth effect." This allows me to assess the relative importance of

growth and exogenous change in movements in the indicator. I do this for the fixed effects estimator.

Table 3 shows the results for all 81 indicators for the fixed effects estimator. Note first that the time shifts are very important for some variables (* indicates significant at 5%), even though we might have worried that such shifts would be imprecisely estimated with time periods as short as a decade. Moreover, most of the time shifts (51 out of 81 indicators) improve quality of life.

How does the exogenous time shift effect compare to the growth effect for each indicator? I will use the same kind of crude indicator count as before. With the Fixed Effects estimator, time shifts were more important than growth effects for 67 percent of the indicators. [21]

I did this exercise also for the First Differences IV estimator. In the sample of 69 indicators available for the First Differences indicator, 62 percent of the indicators had time shifts improve the indicator more than growth did (not shown but available upon request). For example, even a variable as strongly related to income as infant mortality declined more from exogenous change over time (-1.6% per year) than from rising income (-0.9% per year).

I combine this result with the previous results on significance of income. I noted before that 20 out of 81 quality of life indicators had a significantly positive relationship with income under fixed effects. Time improved 10 of these 20 indicators more than income did. The 10 that had growth dominate with a significant positive sign are: a government that does not break contracts, child labor, coups, revolutions, war deaths per capita, calorie intake, protein intake, hospital beds, telephones, and mail. Under the first differences estimator, 6 out of 69 indicators had a positive, significant relationship with income that was more important than exogenous change: government does not break contracts, calorie intake, protein intake, telephones, telegrams, and the share of the bottom income quintile. Of these six, telegrams and the share of the bottom income quintile were not in the fixed effects list but the other four were. With the

SUR estimator, the indicator "government does not break contracts" has an exogenous trend stronger than the growth effect. So there are three variables robust to all three estimators for which growth is the primary life-improving and significant determinant: calorie intake, protein intake, and telephones.

V. Robustness Checks

In this section, I perform a number of robustness checks. I check first-stage regressions, apply some non-parametric tests, check for nonlinearities, and consider the special case of the fast-growing East Asian economies.

One might worry that the IV coefficient estimates on income will be very imprecise if the first stage regression was a poor fit. I have first-stage R-squareds of .32, .23, .23, .10, and .10 for the first stage regressions in the different time periods 60,70,80,90; 80,90; 70,80,90; 70, 80; and 60,70,80. The F-statistic is insignificant only in the last two regressions (actually the same regression given the use of income lagged two periods) for 70,80 and 60,70,80. There are 12 indicators run in first differences -IV that belong to these problematic time periods; only one of them is significant. The estimates for the other time periods seem to be on firmer ground.

Next, I expand the length of period from 10 years to 30 years. Perhaps the decade data are so noisy as to obscure the temporal association of life with growth. How did growth of income over thirty years causally affect the growth of quality of life indicators? I run IV on the 25 indicators that have the requisite data, using the policy indicators as instruments (first stage R2=.29).[22] The results (not shown) have a familiar ring: 4 of the 25 indicators are significant with the "right" sign and 4 with the "wrong" sign. The identity of the "good" significant indicators is also familiar: child labor, infant mortality, phones, and TVs.

As another robustness check, I use a non-parametric test of whether a country that moved up (down) in the ranks of income also moved up (down) in the ranks of the social indicator from 1960 to 1990. I do a simple signs test for whether the sign of the change in the ranking of the

social indicator matched that of the change in income ranking. Six of the 25 variables showed a positive association between the change in rank in income from 1960 to 1990 and the change in rank of the quality of life indicator. Four showed a negative association. Such standard development indicators as female literacy, life expectancy, primary and secondary enrollment, and the share of population with no schooling failed to show improvement with rising income according to this method.

1. Nonlinearities

Next, I check directly whether there were pronounced nonlinearities that might have caused the specifications (1) and (2) to be seriously misspecified. The quality of life literature sometimes postulates a U-shaped or inverted U-shaped function of y for L. Could it be that a zero average relationship obscures a path in which quality of life falls (rises) and then rises (falls) with rising income?

I split the sample for the first-differences IV regression into the portions above and below the whole sample mean across countries. If there were a pronounced U-shape, the coefficient on income growth in this regression should change sign from low to high income. I perform this exercise using both the log-change and linear-change specifications for the dependent variable.

As it turns out, there are only two variables that have significant coefficients of opposite sign between low and high income. The linear change in doctors per capita is negatively and significantly related to income growth at below-average incomes and positively and significantly related to growth at above-average incomes. The change in primary school enrollment is positively associated with growth at below average incomes and negatively associated at above average incomes.

I perform a similar exercise for the fixed effects estimator by adding a quadratic term in the log of initial income to the FE regression. The quadratic term will eventually become dominant so its sign and significance indicate what will eventually happen to the dependent

variable as income rises (the turning points with significant quadratic terms were generally well within the sample range). There were seven indicators that did not significantly improve with growth under the linear specification that do show significant eventual improvement under the quadratic specification (a right-side-up U). However, what the quadratic giveth, the quadratic also taketh away. There were seven indicators that did show improvement under the linear specification that show a significant eventual deterioration under the quadratic specification (an upside down U). There is little evidence that the existence of U-curves is responsible for the low number of quality of life indicators that are positively and significantly related to income under fixed effects.

Note that the quadratic function of income could also capture a monotonic relationship that is concave or convex. This would show up if the turning point in income were close to the endpoints of the income range. Infant mortality, child labor, and mail per capita show a relationship in which there is not much improvement at low income but there is much more at higher incomes. Carbon dioxide emissions, sulfur dioxide emissions, war deaths, and the ratio of females to males for higher education show a relationship to income in which there is a strong change at lower levels of income that tails off at high incomes. (All these results are of the same sign as in the original fixed effects results). The limited number of variables in which concave or convex relationships hold, and with most of these having the same sign and significance as in the fixed effects results, suggest that convexity or concavity of the income-social indicator relationship does not change the basic story.

I next consider whether the existence of some bounded variables may have contributed to the poor results with the linear or log-linear results. I do two monotonic transformations in fixed effects of those L variables bounded between zero and one. First, I use the inverse logistic function $L/(1-L)$, which maps the [0,1] variable into $[0,\infty]$. This transformation implies that y will have a strong effect on L at low incomes, but progressively smaller effects at higher incomes.

Second, I use the negative reciprocal function, -1/L, which maps the [0,1] variable into [-∞,-1]. The negative reciprocal transformation implies that L will hardly improve at low incomes but will improve much at high incomes. I apply these transformations to all the variables that are bounded between zero and one and actually range between zero and one in the sample. These variables are % literate, % no schooling in population, enrollment ratios for primary and secondary education, % with access to clean drinking water (total, rural, and urban), and % with access to sanitation (total, rural, and urban). Of these, the only one where income becomes positive and significant in either of the two functional forms is % rural with access to clean drinking water (negative reciprocal functional form).

I apply a related functional transformation to the first differences IV regression. I estimate the improvement in the L variable as a ratio to the maximum possible improvement: (L-L(-1))/(1-L(-1)).[23] The only variable to become significant in differences in this functional form is the enrollment ratio for secondary education.

Another type of nonlinearity might be irreversibility of social indicators. Some indicators may improve with growth, but not symmetrically worsen with negative growth (for example, roads paved and railroad mileage). I checked this by introducing intercept and slope dummies for observations in which decade growth was negative.[24] The only indicators that support the irreversibility argument (having a significantly lower coefficient when growth is negative) are the ratio of females to males in higher education, hospital beds, and literacy. However, the coefficient on the positive change in income is not significantly different from zero for these three indicators. I conclude that irreversibility is not a major factor in the evolution of social indicators.

2. Changes in Quality of Life Indicators in Fast Growing East Asian Economies

It may be that we fail to detect consistent changes in the quality of life with income because income has not grown very much in many economies. Another robustness check I can perform is to look at the subset of rapidly growing economies. I choose the countries covered in

the World Bank's *East Asian Miracle* – Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand (other high growth economies like Botswana and Lesotho have poor data availability). To summarize a large amount of information, I use the device of examining the change in percentile rank of each country for each indicator from 1960 to 1990. This automatically controls for the global shift in level of each indicator from 1960 to 1990. As shown in Table 4, each of the East Asian miracles moved up by around a quartile in the income ranking from 1960 to 1990. Did they have some similarly large upward movements in the rankings of the quality of life indicators?

Table 4 shows the results for individual indicators and countries. There are some notable successes: the reduction in the unschooled population in Japan (shown with sign reversed), the increase in life expectancy and reduction in infant mortality in Japan, the rise in hospital beds in Korea and Thailand, the increase in TVs in Indonesia and Malaysia, the increase in radios in Indonesia and Korea, the change in telephones in Korea, and the increase in female to male average schooling years in Indonesia. However, another thing to note is the number of *negative* signs (here as elsewhere I change the sign of each indicator so that increase means improved quality of life). Out of 141 entries, 70 are negative – indicating that the East Asian miracles have moved down in the rankings on quality of life indicators about as often as they have moved up. This seems to reinforce the finding from the first difference regressions that there is not a strong tendency for positive changes in quality of life to be associated with positive changes in income.

Examining individual countries, we see that Korea is the only one with a median strong upward movement in quality of life rankings. Examining individual indicators, we see that goods that have a strong private good element –telephones, TVs, and radios – do show a strong upward movement with East Asian growth. There are a couple other indicators that show strong improvement – nurses and ratio of female to male enrollment for secondary education. However,

the median change in percentile ranking in the quality of life indicators is just 3 percentage points.

Figure 5 gives the example of the higher education indicators – both total enrollment and equality between men and women. With total higher education enrollment, three of the tigers – Japan, Taiwan, and Thailand – had faster increases than the world median, but four other tigers had slower increases than the world median despite their faster GDP growth. On the ratio of women to men in higher education, which was significantly related to income in the SUR levels regressions, all of the tigers except Singapore have a slower increase than the world median. (Singapore almost exactly follows the world median, which was why it is hard to distinguish in the graph.)

V. Conclusions

How can the cross-time growth effects be so weak when the cross-section, cross-time income effects are so strong? I believe both findings should be taken seriously, so we need a story of how there could be a strong cross-country relationship but a weak cross-time relationship.

Note first of all that worsening income distribution, as hypothesized by many critics of growth, is *not* the operative mechanism. There is no evidence here that income distribution worsens during growth; actually, there is some evidence that the share of the poor in national income gets better with growth. So what accounts for the strong cross-section cross-time findings but weak cross-time results?

The most prosaic possibility is that the methods of fixed effects and first differences simply remove too much of the signal and leave too much of the noise. The noise may come from measurement error or just from temporary shocks to income or the quality of life indicator. Detecting the signal is less likely once one removes the large cross-section differences in income. However, note that the failure to pick up large quality of life improvements in the fast-growing East Asian is evidence against this view. Moreover, even if measurement error is the problem,

these results are important to show us the limitations of our knowledge on the contemporaneous link between growth and changed quality of life.

There is a related and plausible possibility. Perhaps long and variable lags and the lack of sufficiently long time series prevent the detection in decade changes of the true relationship between life and growth. Recall from the economic history literature on the now-rich nations the documentation of episodes of declining quality of life indicators while per capita income was rising. This historical evidence may reflect the long lags between income growth and quality of life improvements. Similarly for our sample, past growth and social investment over many decades may have been one of the "fixed factors" that was differenced out in the fixed effects and first differences methods. The cross-section may contain the true long-run relationship after all, while the fixed effects and first differences methods just showed the weak contemporaneous part of a long lag structure.

A more fundamental change from conventional wisdom would be that fixed factors really could be the dominant determinant of a country's income and quality of life indicators. As already noted, such fixed factors could include: a country's resource endowments**,** access to the sea**,** ethnic fragmentation, social infrastructure, climate, and legal systems. These factors would create a spurious correlation in the cross section, which would be correctly removed in the fixed effects and first differences methods.

Another possibility is that, since the main criterion for selecting these indicators was that they were at least partially public goods, there is a public goods problem during growth. A rise in private incomes (per capita GDP) does not necessarily translate into increased public goods. John Kenneth Galbraith made a famous argument to this effect for the 1950s US in his *Affluent Society*.

Finally, there is the credible possibility that changes in the home country's quality of life indicators depend as much on changes in *world* income as on changes in *home* country growth.

For example, the improvement in life expectancy everywhere may have reflected technical breakthroughs in antibiotics associated with world economic growth. The strong results on the exogenous time shifts, even in the SUR levels regressions, point in this direction.

In conclusion, the evidence that life gets better during growth is surprisingly uneven, while the cross-country relationship between income and diverse indicators of the quality of life remains strong.

Bibliography

Anand S. and S.M.R. Kanbur, 1993, Inequality and development: a critique, *Journal of Development Economics* 41: 19-43.

Baltagi, Badi H., 1995, *Econometric Analysis of Panel Data*, Wiley: New York.

Barro, Robert and Xavier Sala-i-Martin, 1995, *Economic Growth*, McGraw-Hill: New York.

Barro, Robert. 1996. "Democracy and Growth", *Journal of Economic Growth* 1(1): 1-27.

Barro, Robert, 1997, *Determinants of Economic Growth: A Cross-Country Empirical Study*, MIT Press, Cambridge MA.

Barro, Robert and Jong-wha Lee, 1997, "Determinants of schooling quality," mimeo, Harvard and Korea Universities.

Baumol, William J., Sue Anne Batey Blackman, and Edward N. Wolff, *Productivity and American Leadership: the Long View*, MIT Press, 1989

Bennett, Richard R., 1991, "Development and crime: A cross-national, time-series analysis of competing models," *The Sociological Quarterly* 32(3): 343-363.

Boone, Peter, 1996, "Political and gender oppression as a cause of poverty," mimeo, London School of Economics, April.

Brandt Commission, 1980, *North-South: A Programme for Survival*. (London: Pan Books)

Bruno, Michael and William Easterly, "Inflation Crises and Long-run Growth," *Journal of Monetary Economics*, February 1998.

Clague, Christopher, Philip Keefer, Stephen Knack, and Mancur Olson, 1996, "Property and Contract Rights in Autocracies and Democracies," *Journal of Economic Growth* 1(2): 243-276.

Dasgupta, Partha and Martin Weale, 1992, "On measuring the quality of life," *World Development* 20(1):119-131.

Dasgupta, Partha. 1993. *An Inquiry into the Sources of Well-Being and Destitution*. Oxford: Clarendon Press

Deininger, Klaus and Lyn Squire, "A New Dataset Measuring Income Inequality." *The World Bank Economic Review10(3): 565-91,* September 1996

Easterlin, Richard A. 1996. "Does Satisfying Materal Needs Increase Human Happiness?", Chapter 10 in Richard A. Easterlin, *Growth Triumphant: The Twenty-First Century in Historical Perspective* (Ann Arbor: University of Michigan Press).

Easterly, W. and R. Levine, 1997, "Africa's Growth Tragedy: Policies and Ethnic Divisions, *Quarterly Journal of Economics*, Volume CXII, Issue 4 (November), 1203-1250.

Fahnzylber, Pablo, Daniel Lederman, and Norman Loayza, "What Causes Violent Crime?", Office of the Chief Economist, Latin America Region, World Bank, mimeo, 1998

Fedderke, Johannes and Robert Klitgaard, 1998, "Economic growth and social indicators: An exploratory analysis," ECONOMIC DEVELOPMENT AND CULTURAL CHANGE 46:455-89, April.

Filmer, Deon and Lant Pritchett Child mortality and public spending on health : how much does money matter? Washington, DC : World Bank, Policy research working paper 1864, December 1997.

Fogel, Robert W., 1994, "Economic Growth, Population Theory, and Physiology: the Bearing of Long-term Processes on the Making of Economic Policy," *American Economic Review* 84(3): 369-395.

Fogel, Robert W. 1990. "The Conquest of High Mortality and Hunger in Europe and America: Timing and Mechanisms," *NBER Working Paper Series on Historical Factors in Long Run Growth* No. 16, September.

Greene, William H., 1997, *Econometric Analysis*, (Prentice Hall: Upper Saddle River NJ)

Griliches, Zvi and Jerry Hausman, 1986, "Errors in Variables in Panel Data," *Journal of Econometrics* 31: 93-118.

Grossman, G.M. and Krueger, A. B. 1993 "Environmental impacts of a North American free trade agreement," in P. Garber, ed., *The US Mexico Free Trade Agreement*, Cambridge: the MIT Press, 165-177.

Hall, Robert E. And Charles I. Jones, "Levels of Economic Activity Across Countries," *AMERICAN ECONOMIC REVIEW, PAPERS AND PROCEEDINGS* 87, No. 2:173-177, May 1997

Hall, Robert E and Charles I. Jones, "Why do some countries produce so much more output than others?", Stanford University mimeo, March 1998.

Hamermesh, Daniel S. and Neal M. Soss, 1974, "An economic theory of suicide," *Journal of Political Economy* 82(1): 83-98.

Hardle, Wolfgang. 1990. *Applied Nonparametric Regression*. Cambridge: Cambridge University Press.

Helliwell, John F., 1992, "Empirical linkages between democracy and economic growth," NBER Working Paper 4066, May.

Holtz-Eakin, Douglas and Thomas Selden, 1995, "Stoking the Fires: CO2 Emissions and Economic Growth," *JOURNAL OF PUBLIC ECONOMICS* 57:[85]-101 May.

Huntington, Samuel, 1968, *Political Order in Changing Societies*, New Haven: Yale University Press.

Huntington, Samuel, 1987, "The Goals of Development", in Myron Weiner and Samuel P. Huntington, eds., *Understanding Political Development*, Boston: Little Brown and Company

Independent Commission on Population and the Quality of Life, 1996, *Caring for the Future*. Oxford: Oxford University Press.

Galbraith, John Kenneth. 1958. *The Affluent Society*. (Boston: Houghton Mifflin)

Kakwani, N., 1993, "Performance in living standards: an international comparison," *Journal of Development Economics* 41: 307-336.

Knack, Stephen, and Philip Keefer, 1995, "Institutions and Economic Performance: Cross-country tests using Alternative Institutional Measures," *Economics and Politics*, Vol. 7, No. 3, 207-228.

Knack, Stephen and Philip Keefer, 1997, "Does social capital have an economic payoff? A cross-country investigation," *Quarterly Journal of Economics*, November.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andre Shleifer and Robert Vishny, 1998a, "Law and Finance," *Journal-of-Political-Economy* 106(6), December, pages 1113-55.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andre Shleifer and Robert Vishny, 1998b, "The quality of government," NATIONAL BUREAU OF ECONOMIC RESEARCH WORKING PAPER SERIES No. 6727, September

Lewis, W. Arthur, 1955, *The Theory of Economic Growth* (Irwin: Homewood, IL)

Lindert, Peter H. and Jeffrey G. Williamson, "English Workers' Living Standards During the Industrial Revolution: A New Look", *The Economic History Review*, Second Series, Volume XXXVI, No. 1, February 1983, pp. 1-25.

Lipset, Seymour M., 1959, "Some social requisites of democracy: economic development and political legitimacy," *The American Political Science Review* 53(3), 69-105.

Londregan, John B. and Keith T. Poole, 1990, "Poverty, the coup trap, and the seizure of executive power" *World Politics* 42: 151-83.

Londregan, John B. and Keith T. Poole, 1996, "Does high income promote democracy?" *World Politics* 49(1): 1-30

Mauro, Paolo, 1995, "Corruption and Growth," *Quarterly Journal of Economics,* 110(3): 681-712.

Morris, Cynthia Taft. "How fast and why did early capitalism benefit the majority?" *The Journal of Economic History*, Volume 55, Number 2, June 1995, pp. 211-226.

Morris, Morris David. 1979. *Measuring the condition of the world's poor : the physical quality of life index* (New York : Published for the Overseas Development Council by Pergamon Press)

North, Douglas. 1990. *Institutions, Institutional Change, and Economic Performance* (Cambridge: Cambridge University Press).

Oak Ridge National Laboratory, 1989, *Estimates of CO_2 Emissions from Fossil Fuel Burning and Cement Manufacturing*, ORNL/CDIAC-25, NDP-030, May.

O'Kane, Rosemary, 1983, "Towards an examination of the general causes of coups d'etat," *European Journal of Political Research*, 11: 27-44.

Polak, Ben and Jeffrey G. Williamson, "Poverty, policy, and industrialization: lessons from the distant past," World Bank Working Paper 645, April 1991.

Preston, Samuel H., 1976, "The changing relationship between mortality and level of economic development," *Population Studies* 29:2: 231-247.

Pritchett, Lant and Larry Summers, 1996, "Wealthier is Healthier," *Journal of Human Resources*, 31(4): 841-68

Pritchett, Lant. 1997. "Where has all the Education Gone?", World Bank Working Paper.

Rahav, Giroa and Shiva Jaamdar, "Development and crime: a cross-national study," *Development and Change* 13(4), 447-462.

Ram, Rati 1985, "The role of real income level and income distribution in fulfillment of basic needs," *World Development* 13: 589-594.

Ravallion, Martin, 1990, "Income effects on undernutrition," *Economic Development and Cultural Change* 38: 489-516.

Ravallion, Martin, 1992, "Does undernutrition respond to incomes and prices? Dominance tests for Indonesia," *World Bank Economic Review* 6(1):109-124.

Ravallion, Martin and Shaohua Chen, 1997, "What can new survey data tell us about recent changes in distribution and poverty?", *The World Bank Economic Review* 11(2): 357-82.

Romer, Paul M. 1990. "Human Capital and Growth: Theory and Evidence." *Carnegie-Rochester Series on Public Policy* 32 (1990): 251-86.

Sachs, Jeffrey D. and Andrew Warner, 1995, Natural resource abundance and economic growth. *NATIONAL BUREAU OF ECONOMIC RESEARCH. WORKING PAPER SERIES*, No. 5398:1-47, December

Sachs, Jeffrey D. and Andrew Warner, 1997, "Fundamental sources of long-run growth." *AMERICAN ECONOMIC REVIEW, PAPERS AND PROCEEDINGS* 87, No. 2:184-88, May.

Sen, Amartya, 1994, "Economic regress: concepts and features," *Proceedings of the World Bank Annual Conference on Development Economics*, 315-330.

Shafik, Nemat, 1994, "Economic development and environmental quality: an econometric analysis," *Oxford Economic Papers* 46:757-73 October

Todaro, Michael P. 1997. *Economic Development*. 6th edition, Longman: New York.

United Nations Development Program, 1996, Human Development Report.

United Nations Environment Program Yearbook 1994

Unithan, N. Prabha and Hugh P. Whitt, 1992, "Inequality, Economic Development, and Lethal Violence: A Cross-national analysis of Suicide and Homicide," *International Journal of Comparative Sociology* 33 (4), 182-196.

Wallerstein, Immanuel, 1976, "Modernization: Requiescat in Pace", in Lewis A. Coser and Otto N. Larsen, eds., *The uses of controversy in sociology*, New York: Free Press.

Weede, Erich, 1981, "Income inequality, average income, and domestic violence," *Journal of Conflict Resolution* 25(4): 639-654.

Wheeler, David 1980, "Basic needs fulfillment and economic growth: a simultaneous model," *Journal of Development Economics* 7: 435-451.

Williamson, Jeffrey G. "Was the Industrial Revolution worth it? Disamenities and Death in 19th Century British towns." *Explorations in Economic History* 19, 221-245 (1982)

Wolfe, Barbara and Jere Behrman, 1983, "Is income overrated in determining adequate nutrition?," *Economic Development and Cultural Change* 31: 525-549.

Table 1: Results from pooled time series, cross-section SUR regressions with common country intercept and separate time intercepts

	years	*observations*	*log or linear*	*coefficient*	*t-st*
1.1: Individual Rights and Democracy					
Freedom from Expropriation	80,90	162	linear	1.34	10.
Government does not break contracts	80,90	162	linear	1.47	12.
Bureaucratic quality	80,90	182	linear	1.06	11.
Rule of law	80,90	182	linear	1.08	11.
Freedom from Corruption	80,90	182	linear	0.92	9.
Civil Liberties	70,80,90	381	log	0.35	12.
Human Rights Rating	80,90	170	linear	13.98	9.
% of Children (age 10-14) working (-)	60,70,80,90	248	linear	11.65	7.
Political Rights	70,80,90	381	log	0.41	12.
Index of independence of politics from military	80,90	210	linear	1.01	10.
1.2: Political instability and war					
Cabinet Changes (-)	60,70,80	337	linear	0.09	2.
Deaths from Political Violence, per capita (-)	60,70,80	211	linear	0.02	1.
General Strikes (-)	60,70,80,90	450	linear	-0.04	-1.
Government crises (-)	60,70,80,90	451	linear	-0.03	-1.
Number of assasinations per million per year (-)	60,70,80	89	log	0.22	1.
Number of coups per year (-)	60,70,80	336	linear	0.02	2.
Number of revolutions per year (-)	60,70,80	323	linear	0.08	4.
Purges (-)	60,70,80,90	451	linear	0.01	0.
Riots (-)	60,70,80,90	451	linear	-0.12	-1.
War deaths per capita (-)	60,70,80,90	508	linear	72.38	3.
Freedom from External conflict risk	80,90	210	linear	0.85	5.
Freedom from Civil war risk	80,90	210	linear	0.80	8.
Absence of Racial tensions	80,90	210	linear	0.58	5.
% involved in separatist movements (-)	60,70	157	linear	6.11	3.
1.3: Education					
schooling years for adult population (25+)	60,70,80,90	379	linear	1.87	17.
% literate	60,70,80	331	linear	19.09	12.
% "no schooling" in population (-)	60,70,80,90	355	log	1.00	15.
gross enrollment ratio for higher education	60,70,80,90	399	linear	0.91	16.
gross enrollment ratio for secondary education	60,70,80,90	444	linear	0.19	22.
gross enrollment ratio for primary education	60,70,80,90	452	linear	0.11	10.
museums per capita	60,70	166	log	1.30	13.
Book titles published per capita	60,70,80	236	log	1.29	14.
1.4: Health					
Life expectancy at age zero	60,70,80,90	431	linear	7.47	23.
Mortality - Infant (-)	60,70,80,90	444	log	0.58	20.
Mortality -Under-5 (-)	70,80,90	335	log	0.78	25.
Daily calorie intake	70,80,90	361	log	0.14	18.
daily protein intake	70,80,90	363	log	0.19	16.
hospital beds per capita	60,70,80,90	296	log	0.65	7.
physicians per capita	60,70,80,90	213	linear	4.01	14.

Note: (-) indicates that sign of variable is reversed so that an increase means improved quality of l

	years	*observations*	*log or linear*	*coefficient*	*t-st*
1. 4: Health (continued)					
nurses per capita	60,70,80,90	95	linear	11.63	8.
% with access to safe water	70,90	144	linear	20.57	10.
% rural with access to safe water	70,90	143	linear	17.87	7.
% urban with access to safe water	70,90	152	linear	11.10	5.
Access to sanitation	70,80,90	202	linear	22.94	15.
Access to sanitation (rural)	80,90	142	linear	21.80	10.
Access to sanitation (urban)	80,90	151	linear	15.66	8.
1.5: Transport and Communications					
Paved Roads as share of all Roads	80,90	228	linear	17.24	10.
Road length per car	60,90	132	log	-0.93	-11.
Railroad Mileage per square mile	60,70,80	289	log	0.72	7.
Telephones per capita	60,70,80,90	364	log	1.53	31.
International telexes, minutes per capita	80,90	134	log	0.91	4.
telegrams per capita	70,80,90	156	log	0.75	7.
Radios per capita	60,70,80,90	440	linear	0.82	20.
TVs per capita	60,70,80,90	362	log	1.79	23.
Mail Per capita	60,70	184	log	1.66	17.
Fax machines per capita	80,90	105	log	1.84	18.
1.6: Inequality across class and gender					
Gini coefficient (-)	60,70,80,90	193	linear	3.41	4.
Share of income of bottom 20%	60,70,80,90	157	linear	0.00	0.
Share of income held by middle 60%	60,70,80,90	157	linear	0.03	5.
Share of income of top 20% (-)	60,70,80,90	157	linear	0.03	4.
Female to male schooling years (age 26+)	60,70,80,90	375	linear	0.14	9.
Ratio of Women's Literacy to Men's	60,70,80,90	294	linear	13.12	6.
Female to male primary enrollment	60,70,80,90	390	linear	0.09	9.
Female to male secondary enrollment	60,70,80,90	374	log	0.28	12.
Female to male higher enrollment	60,70,80,90	350	log	0.43	14.
1.7: "Bads"					
Fraud rate per capita (-)	70,80,90	143	log	-1.22	-8.
Freedom from Political terrorism (-)	80,90	210	linear	-0.63	-6.
Homicide rate per capita (-)	70,80,90	141	linear	0.41	0.
manslaughter per capita (-)	70,80,90	104	linear	1.77	3.
Robbery rate per capita (-)	70,80,90	148	log	-0.21	-1.
Rapes per capita (-)	70,80,90	145	log	-0.37	-2.
Drug crimes per capita (-)	70,80,90	139	log	-1.04	-5.
Carbon Dioxide Emissions per capita (-)	60,70,80,90	469	log	-1.47	-32.
Industrl CO2 Emissions Per Capita (-)	70,80,90	375	log	-1.45	-32.
Sulphur Dioxide Emissions per capita (-)	70,80,90	91	log	-1.23	-9.
Nitrogen Oxides Emissions per capita (-)	70,80,90	107	log	-1.10	-16.
Suspended particulate matter (-)	70,80	55	log	0.69	6.
Annual forest area change (%)	60,70,80	343	linear	0.00	4.
Waste paper production per capita (-)	60,70,80,90	191	log	-1.68	-18.
Injuries at work (per 1000 workers) (-)	80,90	110	log	-1.46	-10.
Suicides per capita (-)	70,80	61	log	-0.53	-3.

Note: (-) indicates that sign of variable is reversed so that an increase means improved quality of life

Endnotes

[1] p. 453, Barro and Sala-i-Martin 1995

[2]. Huntington was characterizing the viewpoint of the 60s from the vantage point of the 80s.

[3] Wallerstein 1976.

[4] The most well-known critic of GDP growth is the Human Development Report of the United Nations Development Program, the 1996 issue of which opened with: "The purpose of growth should be to enrich people's lives. But far too often it does not." The Brandt Commission of 1980 warned against the "persistent confusion of growth with development." The 1994 Independent Commission on Population and the Quality of Life concluded that "GNP proves to be an inadequate road-map for the quality of life," a conclusion the authors thought was so important that they repeated the sentence four separate times. The usual concern underlying these sentiments is that income distribution worsens during growth, so that the majority of the population experience no benefits.

[5] Exceptions are Kakwani 1993, Sen 1994, Dasgupta and Weale 1992 and Pritchett and Summers 1995, but they all concentrate on one or a handful of indicators. Conversely, there is a literature on quality of life over time based on a small number of rich countries (e.g. Baumol et al. 1989, Fogel 1994). Finally there is Fedderke and Klitgaard 1998, who do have a diverse set of indicators but have no time dimension.

[6] This project gathered data first from several large cross-national databases available: the World Bank's BESD data collection, Political Risk Services data, Banks 1994, Deininger and Squire 1996, Taylor and Jodice 1983, Barro and Lee 1996, various United Nations publications, and the World Resources Institute 1994. (See Appendix 1 for a full list of sources.) Secondly, I used data from more specialized sources discovered in a literature search over the categories mentioned. Where multiple versions were available of the same indicator were available, I chose the one with the largest number of observations -- other things equal -- and I preferred original sources over secondary sources. When I had two slightly different measures of the same general phenomenon, I keep the one I judge to be closer to "quality of life" and discard the other.

[7] I have an unbalanced panel because of uneven data availability by dates. I estimate (1) with the Least-Squares Dummy Variable method discussed by Greene 1997 and Baltagi 1995, i.e. simply running OLS on y_{it} with dummy variables for the λ_t and μ_i.

[8] The direct source for the first two is Easterly and Levine 1997. The source for inflation is Bruno and Easterly 1998.

[9] Fedderke and Klitgaaard 1998 also found rights, institutional efficiency, political stability, and absence of separatism to improve with per capita income.

[10] The positive correlation between crime and income, or between suicide and income may reflect greater reporting in high-income societies.

[11] The only difference between this moving average over income and the k-nearest neighbor estimator is that the former averages over the k nearest in rank, while the latter averages over the k nearest in distance.

[12] I calculated this by ordering the sample by the dependent variable and showing the mean dependent variable value for the top 30 and the bottom 30.

[13] Other social scientists, such as O'Kane 1983 and Londregan and Poole 1990, have noted the negative cross-national relationship between income per capita and coups, albeit without controlling for country fixed effects.

[14] Microeconomic studies have shown the connection between income and nutrition (Ravallion 1992,1990). Wolfe and Behrman 1983 show that it weakens if they introduce other controls such as mother's knowledge of nutrition (correlated with income -- here's the partial-total problem once again).

[15] I do not have enough data to estimate a relationship between absolute poverty and income. Ravallion and Chen 1997 find a relationship between the increase in mean consumption and the reduction in poverty in a survey panel data set.

[16] Note that most of the data here are from the upper national income quintiles, so we cannot say what is happening at the bottom 1, 2 or even 3 quintiles. The previous literature also showed an ambiguous relationship between crime and income, although again focusing on partial correlations and the cross-section. Rahav and Jaamdar 1982 for example found a positive partial correlation of theft with income and a negative relation of homicide to income. But they were controlling for factors strongly correlated with income such as urbanization, mass communication, transportation, and education. Bennett 1991 looks at INTERPOL cross-country crime statistics. He finds evidence for income per capita raising theft rates but not affecting homicide. His equation includes a number of other control variables. Unnithan and Whitt 1992 find no relationship between homicide and per capita income in a cross-national study. Fajnzylber, Lederman, and Loayza 1998 find no robust link between homicide/robbery and per capita income, either using cross-section or dynamic panel methods.

[17] According to the United Nations Environment Program 1994, staff estimated carbon dioxide emissions based on UN consumption data for gases, liquids and solid fuels plus cement manufacturing -- not bad proxies for GDP. They then apply "appropriate emission factors (P. 34)." Oak Ridge National Laboratory 1989 (the source of the UN

methodology) confirms that these "appropriate emission factors" are applied as constants for each type of fuel (and for cement manufacturing) across countries and across time.

[18] These authors find evidence of quadratic turning points, but they are at very high income levels. Shafik 1994 finds an extremely strong relationship between income and CO2 emissions without correcting for country effects.

[19] Unnithan and Whitt 1992 find that suicide is not significantly correlated with income across nations. Hamermesh and Soss 1974 used micro data and found the sign of the income-suicide relation to be generally negative. There may be differences across cultures in the propensity to report suicides.

[20] The other indicators did not have data for 80 or later, which is required for this method using income lagged two periods, or were missing data on the instruments making the sample too small.

[21] Preston 1976 found that 16 percent of the rise in life expectancy from the 1930s to the 1960s was due to per capita income growth, while 84 percent was due to exogenous time shifts.

[22]The 25 indicators are child labor, strikes, government crises, purges, riots, war deaths per capita, average years of schooling, percent with no schooling, higher education enrollment, secondary enrollment, primary enrollment, life expectancy, infant mortality, hospital beds, doctors per capita, telephones per capita, radios per capita, TVs per capita, the Gini coefficient, ratio of average years of schooling for females to that for males, female literacy, ratio of female to male primary enrollment, ratio of female to male secondary enrollment, ratio of female to male higher educational enrollment, and carbon dioxide emissions.

[23] An anonymous referee suggested this functional form.

[24] I did the regressions with the intercept and slope dummy in OLS, given the difficulty of instrumenting for intercept and slope dummies. An anonymous referee suggested the irreversibility argument.