6-2010

Economic Growth and Social Development

Janelle Jones
Illinois State University

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Advisor: Dr. Ram

Masters of Applied Economics
Capstone
Illinois State University
June 2010

Abstract

The goal of this paper is to examine the relationship between economic growth and social development. The paper looks at the effect of changes in national income in a country on social development of the citizens. Other factors like democratic characteristics and government stability are also considered at a secondary level. Although the main focus is on annual cross-country data for the period 1996-2006, estimates for shorter subperiods are also considered. The role of income relative to 16 proxies for social development is studied, and simple regression models are estimated through the fixed-effects format and also by using instrumental variables. While higher incomes do seem to lead to social development, the effect on several dimensions is not clear or sharp, and the impact seems to vary over time and across countries.

1. Introduction

In a passage from his book Dilemmas of Development, John Toye (1993) writes:

> …the sickness, ignorance, and premature death, not to mention the violence, ugliness and despair of daily life which accompany poverty and underemployment, …revolt most people. Those things can be found in any Third World country on a scale that would never be tolerated elsewhere and they must be eliminated as quickly as humanly possible…economic development should have as its fundamental objective the reduction of poverty.

For decades there was the belief in economics that economic growth was the way to reach nearly all social objectives, poverty reduction, increased literacy, better medical services, etc. However, evidence of countries becoming richer as global poverty rises has challenged this belief. Given the vast amounts of wealth created in the twenty-first century, researchers are calling the completion of some social objectives, like environmental sustainability and poverty reduction, a moral imperative. The relationship between social outcomes and economic growth is complex and interesting.

This paper will focus on the effect of economic growth on several quality-of-life indicators. More specifically, the cross-country effects of economic growth on social outcomes in the areas of education and employment, health, and overall development will be examined. It has been widely documented that women are most often found in poverty, compared to their male counterparts, and face the hardships that accompany that state, so special attention will be given to outcomes that are important to women's development, such as maternal mortality rate and the rate of female progression to secondary school.

The abundance of research around this topic in a number of disciplines has demonstrated its importance to policy makers at the national and global level. The intense pursuit of higher incomes by government officials is usually justified because positive social outcomes are guaranteed by-products. Determining the consequences of economic growth can affect government policies on trade, foreign aid, and inter-country relations; all of which directly impact citizens. Moreover, research in this area might shed some indirect light on how individuals determine or perceive their well being.

The issue of causality between economic growth and social development raises endogeneity concerns in the application of econometric techniques. The empirical results

in this study have been obtained by using a fixed-effects model as well as instrument variables to address such concerns. The countries are also separated according to their level of economic development to test for a possible nonlinear effect of income. The estimates broadly suggest that, besides the effect on other variables, the two social development measures that seem to respond most to economic growth are the proportion of women in the national government and public health expenditures. The role of "democracy" and government "stability" in the effect of income appears minor.

2. Background of Topic

The relationship between economic growth and quality of life has given rise to a large and extensive body of literature. There is no shortage of questions that have been analyzed within this research area. Some examples are: does growth lead to an increased quality of life, does a country need to have passed certain social benchmarks to experience sustainable economic growth, and should data be taken from national accounts or household surveys? As mentioned above, this paper will focus on the impact of economic growth on social outcomes across countries.

Development economics involves applying economic theories, concepts, and models to the study of the development process. Within this branch of economics, per capita gross domestic product is commonly used as a measure of overall well being of a country's citizens. To the extent that this measure gives some indication of standards of living, it can indicate how income change directly impacts the quality of life within a country. However, social indicators can be used as a more specific and direct way to measure quality of life. The link between economic growth and social development is that both capture some aspects of well-being. The economic measure of GDP focuses on households' financial abilities; while social indicators are able to reflect public services, like education and health, and how those change in the development process.

Researchers need to make a decision about how best to capture changes in quality of life with available data. Different studies place different importance on social indicators when measuring quality of life. Sen (1998) argues that mortality statistics are as important as traditional income variables because they highlight social inequalities, gender biases, and racial disparities. This paper partly follows Sen's argument by using

two mortality variables to measure social development. Guiso, Sapienza, and Zingales (2006) focus only on those dimensions of social outcomes that are inherited from previous generations, thus avoiding causality problems due to economic growth and social outcomes both influencing and affecting each other.

There have been results and conclusions found at both ends of the spectrum around this issue. One group has found that economic growth leads to an improvement in nearly every aspect of life. Barro (1996) and Barro and Lee (1997) have found education, health, civil liberties, and environmental policies all become better during periods of positive economic growth. Dollar and Kraay (2002) find that the incomes of the poorest households move with average incomes in low and middle-income countries. On the other hand, recent literature has challenged these results illustrating the importance of the distribution of incomes and growth benefits across different groups in the population. Reuveny and Li (2003) find that depending on the types of economic policies implemented, income inequality may worsen or improve with economic growth. One study of the Pacific Islands region finds that "social objectives can contribute to economic growth" as long as some portion of government resources are being dedicated to social services (Prasad, 2008).

There is a sub-set of this literature that focuses on women's development by examining economic growth and women's development with an approach similar to the one used in this paper. Forsythe, Korzeniewicz, and Durrant (2000) divide the literature into three theoretical frameworks: modernization or neo-classical, women in development (WID), and gender and development (GAD). "Modernization" view states the inequalities between genders will lessen with economic growth. WID postulates that gender inequalities follow a U-shape because at the beginning of the growth process they will become exacerbated, and will lessen in the long run after the country passes some threshold. GAD takes a completely different perspective stating that inequalities are due to institutional factors and the process of economic growth may only worsen matters. "Modernization" appears to be the theme pursued in several studies in the area, and a few examples of that research are mentioned here.

Dollar and Gatti (1999) find that growth does lead to improvements in gender equality, and gender inequality in education leads to lower long term growth rates.

Moreover, they conclude that religious characteristics, civil freedom, and other regional variables explain the majority of gender inequality. Klasen 's (1999) results show that gender inequality in education can also stall progress in health, specifically in reducing fertility and mortality rates. Using the gender-related development index (GDI) developed by the United Nations, Forsythe, Korzeniewicz and Durrant (2000) find that economic development reduces gender inequality when using cross-sectional and longitudinal analyses of 130 countries. Guiso, Sapienze and Zingales (2006) conclude that development that shrinks gender inequality must include increased productivity in female-dominated industries, promote high wage industries, and demand-side management strategies. However, the authors acknowledge the challenge in implementing such policies, especially by small, undeveloped countries up against political and institutional weakness.

3. Model, Data, and Main Results

3.1 Model

Following the methodology of previous studies the model used in my research may be written as:

$$O_{it} = \beta_0 + \beta_1 y_{it} + u_{it} \qquad (1)$$

where *O* is a social outcome indicator, *i* is the country index, t is the time index, and y_{it} is the log of GDP per capita. The model is estimated using two econometric approaches. The first, a fixed-effects model, is commonly used in the literature for cross-country panel data. Certain permanent characteristics of a country, like endowment of natural resources, history of colonization, and distance from large bodies of water, will effect social outcomes and need to be accounted for in the empirical analysis. A fixed-effects model accounts for these time-constant and country specific factors.[1] Also, one must deal with endogeneity issues when studying the relationship between economic growth and social development. In judging how growth affects social outcomes, the empirical model needs to account for the effect that social indicators might have on growth. The most common method used to handle potential endogenous explanatory variables in the

[1] A random-effects model is an alternative to the fixed-effects model for this type of data. However, Hausman's test indicates the fixed-effect format is more appropriate.

literature, and that will be applied here, is the Instrumental Variables (IV) approach. The IV model uses variables, or instruments, in the equation that are uncorrelated with the error terms but correlated with the regressors. For the models that follow, a one period lag of GDP per capita is used as the instrument. Since it is pre-determined, it is likely to be uncorrelated with the error term, but should still have considerable predictive power in determining the current period income.

The outcomes chosen are proxies for aspects of life that are hard to measure. We can describe social development as including three areas of social objectives: (1) employment and education, (2) health, and (3) overall development. The employment and education variables include female unemployment rate, ratio of girls to boys in primary school, male progression to secondary school, female progression to secondary school, female labor force participation rate, and the proportion of seats in national government held by women. The variables measuring health are access to safe water, access to sanitation services, prevalence of contraceptive use, and public health expenditures as a percent of GDP. The overall development measures are gini coefficient, life expectancy, literacy rate, maternal mortality rate, and adult mortality rate. A list of the variable and their definitions can be found in Table 1. The questions of reliability and validity are not answered here as these measures have been used widely in the literature. I will test the null hypothesis of β_1 being equal to zero against the alternative that it is statistically different from zero. A positive β_1 means that a country's income and quality of life move in the same direction. In other words, any increase in GDP has a positive effect on the social outcome being measured. A coefficient that is greater than zero supports the hypothesis that economic growth has a positive effect on the social aspects of a country's residents.

3.2 Data

Data on a variety of social outcomes and economic development variables are available form the World Bank and United Nations. Using the World Development Indicators database and United Nations Human Development Reports a panel data set was created. Social outcomes were chosen based on their availability for the period studied and their impact on the quality of life. Due to data limitations, the sample

Table 1. Variable Descriptions

Variable	Definition
Access to Sanitation Services	Percent of the population with access to sanitation services. Source: United Nations Human Development Report
Access to Safe Water	Percent of the population with access to safe water. Source: United Nations Human Development Report
Women in Government	Proportion of seats held by women in national parliament compared to total seats. Source: United Nations Human Development Report
Ratio of Girls to Boys in Primary and Secondary School	Ratio of girls to boys in primary and secondary school. Source: United Nations Human Development Report
Female Unemployment	Unemployed females age 15 and above expressed as a percentage of the labor force. Source: World Bank Development Indicators Database
Male Progression to Secondary School	Percentage of male students who progress to secondary school from primary school. Source: United Nations Human Development Report
Female Progression to Secondary School	Percentage of female students who progress to secondary school from primary school. Source: United Nations Human Development Report
Female Mortality Rate	Mortality rate of females per 100,000 female ages 15 and above. Source: World Bank Development Indicators Database
Maternal Mortality Rate	The annual number of female deaths from pregnancy-related causes per 100,000 live births. Source: United Nations Development Report
Female Literacy Rate	Literacy rate of adult females as a percent of the females ages 15 and above. Source: World Bank Development Indicators Database
Labor Force Participation Rate, Total	A measure of the proportion of a country's population, age 15 and above, that engages actively in the labor market, either by working or actively looking for work. Source: World Bank Development Indicators Database
Labor Force Participation Rate, Female	Labor force participation rate of females ages 15 and above as a percent of the female population. Source: World Bank Development Indicators Database
Public Health Expenditures	Public health expenditures as a percent of GDP. Source: United Nations Human Development Report
GINI coefficient	Measure of income inequality where 0 is perfect equality and 100 is perfect inequality. Source: United Nations Human Development Report
Contraceptive Prevalence	Percent of female population using any method of contraception. Source: United Nations Human Development Report

Female Life Expectancy	Female life expectancy at birth in years. Source: World Bank Development Indicators Database
GDP per capita	Gross domestic product, in US dollars, divided by mid-year population. Source: World Bank Development Indicators Database

Table 2. Summary Statistics for Entire Sample

Variable	Mean	Standard Deviation	Min	Max	Number of Observations
Access to Sanitation Services	73.58	24.41	14	100	381
Access to Safe Water	84.92	15.94	30	100	453
Women in Government	12.97	9.31	0	39.4	580
Ratio of Girls to Boys in Primary and Secondary School	98.73	7.01	49.9	113.33	410
Female Unemployment	12.61	7.53	1.6	47.1	390
Male Progression to Secondary School	88.38	14.42	37.02	100	340
Female Progression to Secondary School	89.41	13.81	33.24	100	340
Female Mortality Rate	126.99	97.87	46.19	698.07	348
Maternal Mortality Rate	159.4	216.81	0	960	355
Female Literacy Rate	83.57	19.82	21	100	523
Labor Force Participation Rate, Total	67.85	8.20	47.2	86.8	627
Labor Force Participation Rate, Female	55.02	14.75	20.3	83.3	627
Public Health Expenditures	5.70	2.37	0.4	11.4	378
GINI coefficient	39.80	10.66	19.5	74.3	374
Contraceptive Prevalence	54.41	19.11	3	96	203
Female Life Expectancy (years)	72.49	7.82	39	84.04	610
GDP per capita	5523.01	8526.17	229.77	41,445.94	622

covers 57 countries at various levels of development between the years 1996 and 2006. The countries are listed in the Appendix, and Table 2 provides sample statistics.

In addition to studying the relationship in the entire sample, I also estimate the model using three different subsets of countries. This is motivated by the consideration that the structure may differ across income levels. By splitting the sample, it should be possible to shed light on this view. The income cutoffs used for the subsets are based on the World Bank classification. *Developed* countries are those with an average GDP per capita above US$9,300 between 1996 and 2006. *Developing* countries have a range between US$761 and US$9,300 for average GDP per capita during the period, and may be perceived as constituting the middle-income group. Finally, having an average GDP per capita at or below US$760 identifies *Under-Developed* countries, or the low-income group. Using these subsets, one can judge whether initial level of GDP per capita affects the relationship between economic growth and social outcomes.

As an additional exercise, equation (1) is modified to study the possible role of institutions and political stability in regard to the effect of income on social development. The literature discusses at length the importance of political structures and institutions in the economic growth and development of countries. It might be expected that a more democratic government can better translate higher incomes into social development for the citizens. The democracy variables used in this paper come from the Polity IV data which is collected by political scientists and contains data on a number of political indicators. Two measures of institutions and government that are used from the Polity IV database are DEMOC and DURABLE. The DEMOC variable compiles measures of political participation, openness and competitiveness of executive recruitment, and constraints on the chief executive into a 10 point scale, with 10 being "strongly democratic." DURABLE is the number of years since the last national regime change. Thus, a larger value indicates a higher level of government stability.

3.3 Empirical Results

3.3.1 Entire Sample

Table 3 contains the main results. In general, while GDP per capita has a significant effect with the expected signs in most cases in the fixed-effects format, the IV estimates

Table 3. Results for Entire Sample

Variable	Fixed-effect model Log GDP coefficient	IV model Log GDP coefficient
Access to Sanitation Services	0.103 (0.81)	0.714 (0.91)
Access to Safe Water	0.178 (3.26)	-0.116 (-0.68)
Proportion of Women Seats in Parliament	1.197 (9.30)	1.625 (3.11)
Ratio of Girls to Boys in Primary and Secondary School	0.029 (2.49)	0.029 (1.51)
Female Unemployment	-0.486 (-4.73)	-0.647 (-1.47)
Male Progression to Secondary School	0.059 (1.85)	0.022 (0.54)
Female Progression to Secondary School	0.063 (1.84)	0.031 (0.69)
Female Adult Mortality Rate	-0.010 (-1.29)	-1.514 (-1.28)
Maternal Mortality Rate	-1.269 (-5.72)	0.932 (0.60)
Female Literacy Rate	0.158 (6.35)	-0.187 (-1.00)
Labor Force Participation Rate, Total	-0.019 (-2.20)	0.034 (0.98)
Labor Force Participation Rate, Female	0.039 (2.03)	0.146 (2.15)
Public Health Expenditures as a % of GDP	1.389 (6.87)	3.767 (2.13)
GINI coefficient	0.071 (2.41)	0.116 (1.30)
Contraceptive Prevalence	0.314 (2.19)	0.115 (0.14)
Female Life Expectancy	0.038 (2.78)	-0.009 (-0.11)

Note: The t-statistics, based on heteroskedasticity robust standard errors, are in parentheses. Each dependent variable is measured in natural log. A one period lag of GDP is used as an instrument in the IV model. Tests for weakness and under-identification of instruments showed instrument was appropriate. The sample includes fifty-seven countries.

seem considerably weaker. The following patterns are suggested by the estimates.

First, there are three outcome variables for which the fixed effects (FE) and instrumental-variable (IV) models yield a consistent pattern in terms of signs and statistical significance. These are (a) proportion of women seats in parliament, (b) female labor force participation rate, and (c) public health expenditures. It seems, therefore, that increased income enhances several aspects of social development, particularly for women, and the magnitude of the impact seems generally sizable..

Second, access to safe water, girls-boys ratio at primary and secondary levels, female unemployment, maternal mortality, female literacy, contraceptive prevalence, and female life expectancy have the expected signs and show statistical significance at the usual levels in the FE format, but lose significance in the IV estimates, and even have unexpected signs for access to safe water, maternal mortality, female literacy, and female life expectancy. It is, therefore, difficult to make a clear statement about the effect of increased income on these variables.

Third, variables representing male and female progression to secondary level are marginally significant in FE format, but lack significance in IV models, and thus a clear statement about the role of income relative to these variables is problematic.

Fourth, overall labor force participation rate has a significant negative sign in FE model, but is positive and insignificant in terms of IV estimates. Similarly, Gini has a significant positive sign in FE model, but lacks significance in IV format. It is, therefore, difficult to say how income affects these dimensions of social development.

The overall scenario appears to be that full-sample estimates show income having a significant and possibly sizable role in enhancing social development along three dimensions in terms of both FE and IV models. For other variables, it is difficult to make a clear statement since FE and IV estimates are not consistent in terms of significance or sign.

3.3.2 Developed Countries

Table 4 reports the relevant estimates. The discussion of the results is brief since the study focuses on the less-developed world, and the group includes only seven countries with a relatively small sample size.

Table 4. Results for Developed Countries

Variable	Fixed-effect model Log GDP coefficient	IV model Log GDP coefficient
Access to Sanitation Services	-0.930 (-2.98)	-0.127 (-0.05)
Access to Safe Water	-0.025 (-1.39)	0.069 (0.51)
Proportion of Women Seats in Parliament	2.115 (7.50)	2.12 (2.22)
Ratio of Girls to Boys in Primary and Secondary School	-0.109 (-6.16)	-0.110 (-4.96)
Female Unemployment	-0.880 (-2.58)	-0.558 (-0.56)
Male Progression to Secondary School	0.013 (0.64)	-0.005 (-0.18)
Female Progression to Secondary School	-0.028 (-1.41)	-0.022 (-0.87)
Female Adult Mortality Rate	-0.737 (-7.83)	-0.737 (-7.83)
Maternal Mortality Rate	-3.87 (-2.91)	-6.146 (-2.64)
Female Literacy Rate	0.070 (1.34)	0.038 (1.06)
Labor Force Participation Rate, Total	0.106 (8.28)	0.157 (4.14)
Labor Force Participation Rate, Female	0.222 (4.82)	0.437 (2.77)
Public Health Expenditures as a % of GDP	1.025 (3.83)	1.207 (2.54)
GINI coefficient	0.026 (0.29)	0.031 (0.044)
Contraceptive Prevalence	0.101 (1.91)	-0.002 (-0.60)
Female Life Expectancy	0.133 (5.64)	0.158 (3.07)

Note: The t-statistics, based on heteroskedasticity robust standard errors, are in parentheses. Each dependent variable is measured in natural log. A one period lag of GDP is used as an instrument in the IV model. Tests for weak and under identification of instruments showed instrument was appropriate. The sample includes seven countries.

The first point to note is that FE and IV estimates are consistent in being significant and having the expected signs for seven variables, namely, (a) women in parliament, (b) female mortality, (c) maternal mortality, (d) overall labor force participation, (e) female labor force participation, (f) public health expenditures, and (g) female life expectancy. It is thus interesting to see that, despite its high income, increased income in this group appears to enhance social development along more dimensions than is observed for the full sample.

Second, girls-boys ratio at primary and secondary levels has a negative sign that carries statistical significance in both FE and IV formats. It is difficult to interpret this pattern.

Third, variables representing access to safe water, male and female progression to secondary level, female literacy, and contraceptive prevalence lack significance. This is probably due to the high level of these variables in this group. Access to sanitation and female unemployment have negative sign and show significance in FE model, but lack significance in IV estimates. Gini has insignificant estimates in both models.

3.3.3 Developing (Middle-Income) Countries

Table 5 reports the estimates for this group. The following patterns may be noted.

First, maternal mortality is the only variable for which both FE and IV estimates show the effect to have the expected (negative) sign and carry statistical significance. For the other 15 variables, either the IV estimates lack statistical significance, while FE is significant, or both FE and IV lack significance. This is surprising since in the developed group, despite a much smaller sample size, seven variables showed significant effects in the expected directions in both models. At any rate, it is difficult to make a clear statement about the role of income relative to these 15 variables in the developing (middle-income) group, which constitutes the largest subset of the sample countries.

Second, however, women's seats in parliament, female unemployment, female literacy, female labor force participation, and female life expectancy show expected signs and statistical significance in the FE format and provide a hint of increased income contributing to social development on these dimensions that reflect female well-being. However, lack of significance in IV estimates makes a clear inference difficult.

Table 5. Results for Developing (Middle-Income) Countries

Variable	Fixed-effect model Log GDP coefficient	IV model Log GDP coefficient
Access to Sanitation Services	0.159 (1.63)	0.334 (0.86)
Access to Safe Water	0.124 (2.02)	-0.189 (-0.55)
Proportion of Women Seats in Parliament	1.275 (7.79)	1.048 (1.84)
Ratio of Girls to Boys in Primary and Secondary School	0.004 (0.52)	0.007 (0.54)
Female Unemployment	-0.498 (4.55)	-0.360 (-0.97)
Male Progression to Secondary School	0.071 (1.50)	0.020 (0.42)
Female Progression to Secondary School	0.061 (1.25)	0.010 (0.21)
Female Adult Mortality Rate	-0.170 (-1.89)	0.045 (0.15)
Maternal Mortality Rate	-1.226 (-5.91)	-2.600 (-2.80)
Female Literacy Rate	0.145 (5.58)	0.053 (0.44)
Labor Force Participation Rate, Total	-0.007 (-0.75)	-0.034 (-0.70)
Labor Force Participation Rate, Female	0.085 (3.94)	0.057 (0.55)
Public Health Expenditures as a % of GDP	0.925 (3.00)	-0.094 (-0.04)
GINI coefficient	0.099 (2.99)	0.245 (1.50)
Contraceptive Prevalence	0.219 (0.97)	-2.030 (-1.35)
Female Life Expectancy	0.026 (2.07)	-0.050 (-0.65)

Note: The t-statistics, based on heteroskedasticity robust standard errors, are in parentheses. Each dependent variable is measured in natural log. A one period lag of GDP is used as an instrument in the IV model. Tests for weakness and under-identification of instruments showed instrument was appropriate. The sample includes forty countries.

Third, positive sign on Gini and its significance in the FE format might indicate a disequalizing effect of income growth in this group.

Fourth, girls-boys ratio, progression to secondary school, overall labor force participation, and contraceptive use lack significance in both models.

Last, one may, therefore, say that, except for the role of income in lowering maternal mortality, the effect of increased income on most dimensions of social development appears uncertain or weak in middle-income countries.

3.3.4 Under-developed (Low-income) Countries

Table 6 reports the estimates. The following points seem noteworthy.

First, there are four variables which have the expected signs and show significance both FE and IV models. These are (a) women in parliament, (b) girls-boys ratio at primary and secondary levels, (c) female literacy, and (d) public health expenditure. Thus despite a smaller sample size, IV estimates show expected signs and significance in more cases in this group than in the full sample or the developing-country group. Moreover, the magnitude of the effects is sizable, particularly for public health outlays.

Second, overall and female labor force participation rates carry statistical significance in both FE and IV models, but carry negative signs. It is difficult to interpret these estimates.

Third, access to safe water and maternal mortality have the expected signs and carry significance in the FE format, but lack significance in the IV models. Thus one might say there is weak evidence that increased income helps in terms of greater safe-water access and reduced maternal mortality.

Fourth, the other eight variables show lack of statistical significance in both models, and may be deemed to be not affected significantly by increased income or economic growth.

Table 6. Results for Under-Developed (Low-Income) Countries

Variable	Fixed-effect model Log GDP coefficient	IV model Log GDP coefficient
Access to Sanitation Services	0.061 (0.20)	-0.845 (-0.54)
Access to Safe Water	0.367 (2.74)	1.403 (1.61)
Proportion of Women Seats in Parliament	0.931 (3.23)	2.085 (2.63)
Ratio of Girls to Boys in Primary and Secondary School	0.134 (3.10)	0.136 (3.16)
Female Unemployment	-0.147 (-0.54)	3.997 (0.79)
Male Progression to Secondary School	0.046 (0.48)	0.040 (1.03)
Female Progression to Secondary School	0.110 (1.12)	0.125 (1.61
Female Adult Mortality Rate	-0.211 (0.95)	5.297 (1.91)
Maternal Mortality Rate	-1.156 (-2.65)	-1.344 (-1.27)
Female Literacy Rate	0.145 (5.58)	1.192 (2.26)
Labor Force Participation Rate, Total	-0.066 (-6.05)	-0.242 (-2.60)
Labor Force Participation Rate, Female	-0.077 (-4.28)	-0.344 (-2.31)
Public Health Expenditures as a % of GDP	3.190 (7.41)	4.174 (3.72)
GINI coefficient	-0.055 (-0.75)	-0.040 (-0.28)
Contraceptive Prevalence	0.573 (1.89)	3.500 (1.43)
Female Life Expectancy	0.087 (1.56)	-0.105 (-0.24)

Note: The t-statistics, based on heteroskedasticity robust standard errors, are in parentheses. Each dependent variable is measured in natural log. A one period lag of GDP is used as an instrument in the IV model. Tests for weakness and under-identification of instruments showed instrument was appropriate. The sample includes ten countries.

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3.3.5 Democratic Institutions and government Stability

To study the role of political institutions and the stability of the national government relative to the effect of increased income on social outcomes, interaction terms were added. The variables DEMOC and DURABLE which measure democratic characteristics and stability were interacted with GDP per capita and added as explanatory variables. Table 7 presents the estimates, which are based on the IV format and the full sample.

The main point conveyed by the table is that neither "democracy" nor government stability affects the role of income in social development. Of the 32 interaction terms, only one (for female unemployment) is significant at the 5% level. Even in this case, the estimate is somewhat perverse since it indicates that a more "democratic" regime lowers the female-unemployment-reducing effect of increased income.

It is also to be noted that estimated coefficients of most interaction terms are tiny. Moreover, quality of the estimated parameters of the main variables seems to have been adversely affected by the introduction of interaction terms. Despite lack of significance of most interaction terms, magnitudes of the main parameters show sizable differences in many cases from the corresponding numbers in Table 3. It is possible that collinearity between the main variables and the interaction terms has lowered the statistical significance of all estimates and has also caused the main parameter estimates to diverge substantially from the corresponding numbers in Table 3.

The main conclusion from Table 7 is that "democracy" or "stability" seems to have little significant influence relative to the role of increased income in enhancing social development. It is possible that collinearity between the main variables and the interaction terms has lowered the precision of all estimates, and has thus made it more difficult to derive a clear inference on the role of democracy and government stability in regard to the effect of increased income on social development. It is also possible that while one does not see a clear role of these institutional characteristics in the full sample, the position is less hazy in some of the subsets of countries. Alternatively, one might find a somewhat clearer position if the number of sample countries or the years covered were larger.

Table 7. Results Using Policy Interaction Terms

Variable	Log GDP coefficient	GDP X Democracy	GDP X Stability
Access to Sanitation Services	0.764 (0.78)	-0.002 (-0.36)	
	0.708 (0.79)		-0.001 (-0.072)
Access to Safe Water	-1.915 (-0.86))	0.011 (0.94)	
	0.112 (0.50)		0.000 (0.56)
Proportion of Women Seats in Parliament	1.539 (2.82)	0.006 (1.64)	
	2.014 (2.90))		-0.001 (-0.89)
Ratio of Girls to Boys in Primary and Secondary School	0.035 (1.57)	0.000 (-0.15)	
	0.040 (1.85)		0.000 (-0.77)
Female Unemployment	-0.740 (-1.43)	0.006 (2.59)	
	-0.397 (-0.54)		0.000 (0.11)
Male Progression to Secondary School	0.062 (1.72)	-0.000 (-0.77)	
	0.054 (1.29)		0.000 (0.10)
Female Progression to Secondary School	0.065 (1.52)	0.001 (0.66)	
	0.053 (1.02)		0.000 (0.36)
Female Adult Mortality Rate	-1.673 (-1.21)	0.009 (1.09)	
	-0.984 (-1.26)		0.001 (1.09)
Maternal Mortality Rate	-11.201 (-0.65)	0.043 (0.46)	
	2.252 (0.99)		-0.008 (-1.80)
Female Literacy Rate	-0.384 (-1.18)	0.002 (-1.18)	
	-0.479 (-0.89)		0.001 (0.50)
Labor Force Participation Rate, Total	0.184 (1.16)	-0.001 (-1.31)	

	0.295 (0.89)		0.000 (-0.77)
Labor Force Participation Rate, Female	0.125 (1.82)	-0.001 (-0.87)	
	-0.120 (-1.76)		0.000 (1.78)
Public Health Expenditures as a % of GDP	4.286 (1.90)	0.006 (0.57)	
	6.238 (1.89)		-0.004 (-0.77)
GINI coefficient	0.094 (1.05)	0.001 (1.50)	
	0.259 (1.27)		-0.000 (-1.04)
Contraceptive Prevalence	0.675 (0.75)	-0.002 (-0.34)	
	-0.196 (-0.19)		0.001 (0.68)
Female Life Expectancy	0.030 (0.17)	0.000 (0.11)	
	0.018 (0.08)		0.000 (-0.10)

Note: Results are from an IV model with lag of GDP per capita as the only instrument. t-statistics are listed in parentheses. The sample includes fifty-seven countries.

3.3.6 Short Term Changes

The 10-year panels studied in the preceding sections indicate the scenario for a fairly long period. Since the structure of the relations may change over a 10-year period, it is useful to do at least a preliminary study of the relations over shorter periods. For that purpose, the 10-year period is divided into three subperiods covering 1996-1999, 2000-2003, and 2004-2006, and pooled OLS regressions are run for each subperiod. These regressions are different from those in earlier tables; neither a fixed-effect nor an IV format is used, but OLS regressions are run on pooled data with logarithm of current-period GDP per capita as the regressor for each of the 16 social development indicators. Therefore, these estimates are not quite comparable with those in earlier tables, and need to be interpreted with caution due to (a) potential problem of endogeneity, and (b) lack of control for cross-country heterogeneity. Table 8 contains the estimates for the 16 variables covering each subperiod, and suggest the following observations.

Table 8. OLS Regression Estimates Based on Pooled Data for Sub-periods

Variable	Years	GDP Coefficient	t-stat
Access to Sanitation Services	1996-1999	0.262 (0.042)	6.24
	2000-2003	0.187 (0.030)	6.25
	2004-2006	0.238 (0.028)	8.62

Variable	Years	GDP Coefficient	t-stat
Access to Safe Water	1996-1999	0.156 (0.020)	7.63
	2000-2003	0.105 (0.015)	7.23
	2004-2006	0.091 (0.012)	7.33

Variable	Years	GDP Coefficient	t-stat
Proportion of Women Seats in Parliament	1996-1999	0.331 (0.045)	7.39
	2000-2003	0.317 (0.039)	8.12
	2004-2006	0.299 (0.050)	6.00

Variable	Years	GDP Coefficient	t-stat
Ratio of Girls to Boys in Primary and Secondary School	1996-1999	0.031 (0.015)	2.12
	2000-2003	0.023 (0.006)	4.09
	2004-2006	0.013 (0.006)	2.16

Variable	Years	GDP Coefficient	t-stat
Female Unemployment	1996-1999	-0.118 (-0.069)	-1.70
	2000-2003	-0.151 (0.062)	-2.42
	2004-2006	-0.183 (0.079)	-2.30

Variable	Years	GDP Coefficient	t-stat
Male Progression to Secondary School	1996-1999	0.059 (0.024)	2.46
	2000-2003	0.052 (0.010)	5.41
	2004-2006	0.059 (0.019)	3.17

Variable	Years	GDP Coefficient	t-stat
Female Progression to Secondary School	1996-1999	0.065 (0.026)	2.55
	2000-2003	0.060 (0.011)	5.67
	2004-2006	0.070 (0.021)	3.36

Variable	Years	GDP Coefficient	t-stat
Female Adult Mortality Rate	1996-1999	-0.222 (0.021)	-10.67
	2000-2003	-0.277 (0.020)	-13.66
	2004-2006	0.284 (0.029)	-9.83

Variable	Years	GDP Coefficient	t-stat
Maternal Mortality Rate	1996-1999	-0.662 (0.067)	-9.93
	2000-2003	-0.819 (0.055)	-15.01
	2004-2006	-0.901 (0.110)	-8.21

Variable	Years	GDP Coefficient	t-stat
Female Literacy Rate	1996-1999	0.133 (0.019)	7.11
	2000-2003	0.124 (0.019)	6.60
	2004-2006	0.112 (0.017)	6.44

Variable	Years	GDP Coefficient	t-stat
Labor Force Participation Rate, Total	1996-1999	0.017 (0.007)	2.42
	2000-2003	0.022 (0.007)	3.18
	2004-2006	0.025 (0.008)	3.04

Variable	Years	GDP Coefficient	t-stat
Labor Force Participation Rate, Female	1996-1999	0.019 (0.018)	1.07
	2000-2003	0.033 (0.017)	1.96
	2004-2006	0.048 (0.019)	2.56

Variable	Years	GDP Coefficient	t-stat
Public Health Expenditures as a percent of GDP	1996-1999	0.340 (0.038)	9.01
	2000-2003	0.076 (0.021)	3.57
	2004-2006	0.080 (0.030)	2.65

Variable	Years	GDP Coefficient	t-stat
GINI Coefficient	1996-1999	-0.029 (0.022)	-1.30
	2000-2003	-0.060 (0.012)	-4.84
	2004-2006	-0.059 (0.016)	-3.81

Variable	Years	GDP Coefficient	t-stat
Contraceptive Prevalence	1996-1999	0.299 (0.051)	5.82
	2000-2003	0.206 (0.094)	2.21
	2004-2006	0.111 (0.093)	1.20

Variable	Years	GDP Coefficient	t-stat
Female Life Expectancy	1996-1999	0.057 (0.004)	14.47
	2000-2003	0.061 (0.005)	12.10
	2004-2006	0.063 (0.007)	9.29

Note: The results are from OLS regressions with log of GDP per capita as the explanatory variable. Standard errors, which are in parentheses, and t-statistics are corrected for heteroskedasticity. The sample includes all fifty-seven countries.

First, in a sharp contrast from Table 3 (and Tables 4, 5 and 6), almost all estimates have the expected signs and carry statistical significance at the usual levels. The contrast seems remarkable, but makes the interpretation of the sub-period estimates difficult.

Second, magnitude of some of the sub-period estimates tends to be similar to that in Table 3 for FE or IV models, but is quite different for many others. For example, while Table 3 indicates fairly high positive FE and IV estimates for women in parliament and public health expenditures, the corresponding coefficients are much smaller in Table 8, but still carry statistical significance.

Third, despite some exceptions, most estimates are fairly stable across the three sub-periods. This is interesting and makes it harder to see why several sub-period estimates differ markedly from the 10-year estimates in terms of statistical significance, signs, and magnitudes. One possible view is that the sub-period estimates might be contaminated by endogeneity or cross-country heterogeneity, and may need to be interpreted with considerable caution.

Fourth, the main conclusion appears to be that while OLS estimates from pooled observations for the sub-periods indicate GDP per capita to be associated with social development along most of the 16 indicators, it is difficult to draw a clear conclusion because of the divergence between these estimates and the full-period FE and IV estimates.

3.4 A General Summary of Indicators Where Income Helps

Public health expenditures, female life expectancy, maternal mortality rate, and proportion of seats in parliament held by women seem significantly responsive to higher

incomes. By way of a general illustration, Table 9 summarizes the coefficients of three of these variables from FE and IV models for the entire sample and the three subsamples.

Table 9. Coefficients of Variables with Strongest Effects of Income

Countries	Model	Regressor	Public Health Expenditures	Maternal Mortality Rate	Proportion of Women Seats in Parliament
Entire Sample	Fixed-effects	Log GDP per capita	1.389 (6.87)	-1.269 (-5.72)	1.197 (9.30)
	IV	Log GDP per capita	3.767 (2.13)	0.932 (0.60)	1.625 (3.11)
Developed Countries	Fixed-effects	Log GDP per capita	1.025 (3.83)	-3.87 (-2.91)	2.115 (7.50)
	IV	Log GDP per capita	1.207 (2.54)	-6.146 (-2.64)	2.12 (2.22)
Developing Countries	Fixed-effects	Log GDP per capita	0.925 (3.00)	-1.226 (5.91)	1.275 (7.79)
	IV	Log GDP per capita	-0.094 (-0.04)	-2.600 (2.80)	1.048 (1.84)
Under-Developed Countries	Fixed-effects	Log GDP per capita	3.19 (7.41)	-1.156 (-2.65)	0.931 (3.23)
	IV	Log GDP per capita	4.174 (3.72)	-1.344 (-1.27)	2.085 (2.63)

Notes: Related t-statistics are in parentheses. Each dependent variable is measured in natural logs. The numbers are taken from Tables 3, 4, 5, and 6.

It may be seen that the FE models show these indicators responding well to income growth in all cases. The IV format also generally supports that scenario, but indicates a weak response or unexpected sign for (a) health expenditure in developing countries, and (b) maternal mortality in the full sample. However, one can make a general statement that social development along these indicators is helped by income growth. For other indicators, the position is somewhat ambiguous. It is possible that income helps social development along some of those indicators also in some countries and during certain periods, but it is difficult to make a general statement. While Table 9 is intended to show a quick and general picture, the next section provides a slightly more detailed indication of the cases where income helps.

4. Summarizing and Concluding Observations

This paper studies the effect of income growth on social development. Data for 57 countries on 16 indicators of social development covering the period 1996-2006 are used. The relation is studied for the 10-year panel for the entire sample and for three subsets of countries. A preliminary analysis is also done for three subperiods. In most cases, each social indicator is regressed on real GDP per capita. In addition, the possible role of democratic institutions and government stability relative to the effect of income on social development is also considered. Estimates for the 10-year panels are obtained by using the fixed-effects (FE) format and also through a simple instrumental-variable (IV) approach in which one-period lag of GDP per capita is used as an instrument. Ten points summarize the main findings.

First, there is considerable divergence between FE and IV estimates in many cases, and the latter tend to show significance in fewer cases. This makes a clear or general inference difficult for many indicators.

Second, in the 10-year panel of 57 countries, both FE and IV coefficients show that increased income significantly helps social development in terms of women's representation in parliament, female labor force participation, and public health expenditure. For other indicators, a clear conclusion is difficult due to FE and IV estimates being different.

Third, for the group of developed countries, FE and IV estimates in the 10-year panel show that increased income helps social development in terms of women's representation in parliament, female mortality, maternal mortality, female and total labor-force participation, public health expenditure, and female life expectancy. The estimates, however, show a decline in girls-boys ratio in school with increased income. It is interesting to note that the developed-country group indicates a more pervasive effect of income on social development than the rest of the sample.

Fourth, for the middle-income (developing) group, the 10-year panel shows that only women's representation in parliament and maternal mortality are helped by increased income in terms of both FE and IV models, although the former is only

marginally significant in terms of the IV estimate.. For other indicators, the position is ambiguous.

Fifth, for the low-income (underdeveloped) group, both FE and IV estimates from the 10-year panel suggest that increased income helps in terms of women's representation in parliament, girls-boys ratio in school, female literacy, and public health expenditure. Increased income, however, seems to lower overall and female labor-force participation.

Sixth, looking at the entire sample, democratic institutions and government stability seem to have little role in the relation between income and social development. The estimates in this part, which is based on addition of interaction terms, appear to have been weakened by collinearity between income and the interaction terms. Despite lack of significance of the interaction terms in most cases, coefficients of the income variable are quite different from those without the interaction term in many cases.

Seventh, estimates from three shorter panels of the entire 57-country sample show statistical significance and expected signs for almost all indicators and subperiods. However, since these are OLS estimates from pooled panels, it is difficult to draw strong conclusions due the potential problems of endogeneity and cross-country heterogeneity.

Eighth, the overall message from the study seems to be that the role of income in enhancing social development is significant and possibly sizable in terms of at least three or four indicators, but is ambiguous for others.

Ninth, study of the relation across subsets of countries that have different income levels, and across subperiods, suggests that the role of income in social development probably varies across countries and time. Considering that and the preceding paragraph, one may say that it is not evident that income growth by itself may be expected to generate "adequate" social development. The role of public policy may be important in helping income growth to generate commensurable social development.

Last, there are several ways in which this research can be refined. These include (a) expansion of the country coverage, (b) consideration of other indicators of social development, (c) use of richer models and better estimation procedures, (d) robustness analysis, (e) greater attention to the quantitative magnitude of the impact of income on various dimensions of social development, and (f) use of an income measure that has greater cross-country comparability.

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Appendix. List of Countries

Algeria[2]	Germany[1]	Morocco[2]
Argentina[2]	Ghana[3]	Namibia[2]
Barbados[2]	Hungary[2]	Norway[1]
Belarus[2]	Iceland[1]	Panama[2]
Belize[2]	India[3]	Paraguay[2]
Bolivia[2]	Iran, Islamic Rep.[2]	Peru[2]
Botswana[2]	Jamaica[2]	Samoa[2]
Bulgaria[2]	Kazakhstan[2]	Slovak Republic[2]
Cambodia[3]	Korea, Rep.[1]	St. Lucia[2]
Colombia[2]	Latvia[2]	Switzerland[1]
Costa Rica[2]	Lebanon[2]	Syrian Arab Republic[2]
Croatia[2]	Lesotho[3]	Tonga[2]
Czech Republic[2]	Lithuania[2]	Trinidad and Tobago[2]
Ecuador[2]	Macedonia, FYR[2]	Tunisia[2]
Egypt, Arab Rep.[2]	Mauritania[3]	United Arab Emirates[1]
El Salvador[2]	Mauritius[2]	Vanuatu[2]
Estonia[2]	Mexico[2]	Venezuela, RB[2]
Finland[1]	Moldova[3]	Vietnam[3]
Georgia[3]	Mongolia[3]	Yemen, Rep.[3]

Note: * 1, 2, and 3 indicate inclusion in the *Developed, Developing, and Under-developed* country subsets, respectively