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Changing Patterns of Child Labor around the World since 1950: The Roles of Income Growth, Parental Literacy and Agriculture

Victoria Gunnarsson
Peter F. Orazem
Guilherme Sedlacek

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Social Protection Unit

Human Development Network

The World Bank

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Child labor is widely considered to be a social problem that must be minimized, if not

eliminated. The 1989 Convention on the Rights of the Child, which required that children be

protected from work that harms their health, educational opportunities, and mental, physical,

social, or moral development, was signed by 191 countries. Despite this widespread

condemnation, about one of every eight children aged 10 to 14 worldwide works.

Nevertheless, there has been progress in lowering the incidence of child labor over the

past half century. To formulate policy to maintain that progress, it is important to take stock of

why child labor has decreased in the past. This study explores the roles of rising per capita

income, improving adult literacy, and economic transformation from a rural agrarian economy to

an urban industrialized base. All prove to be important in explaining why child labor has

declined over time, why child labor persists, and how it may be combated in the future.

Factors Affecting Child Labor

Throughout history, children have worked to contribute to family income. In turn-of-the-

century households in the United States, income derived from child labor was used primarily for

immediate household consumption needs (Parsons and Goldin 1989). Some child labor involved

parents who wanted to maximize their own consumption at the expense of their children's future.

For example, Galbi (1997) found that child labor substituted for adult labor in the early years of

the industrial revolution. Horrell and Humphries (1995) argued that industrialization also caused children to initiate work at younger ages as their older siblings gained independence and therefore left the household. However, the increase in child labor during the early period of the industrial revolution appears to be due more to falling income opportunities for parents. Adults without factory experience proved to be poor factory workers. As the first generation of working children aged and became parents, their children were less likely to work. Therefore, the time path of child labor participation during the industrial revolution appears to be consistent with most contemporary studies that find the incidence of child labor declines as household income rises.

The preponderance of evidence across many different countries finds that child labor is primarily a result of material needs and not parental indifference to their children's welfare. That conclusion is immediately apparent in figures 1a and 1b, which show scatter plots of per capita income and the proportion of children aged 14 and under who worked for a wide range of countries for the years 1960 and 1990. Several conclusions can be derived from the plots. First, there has been a clear reduction in the incidence of child labor. While nearly 28% of children were working in 1960, the average in 1990 had fallen to less than 15%. Worldwide, the decrease in child labor over time corresponds to a decline in the number of countries with very low income. Countries such as Burkina Faso, Mali, Niger, and Thailand experienced large reductions in child labor force participation rates as their real incomes rose from absolute poverty levels. Countries that did not experience rising real per capita incomes (Laos, Nicaragua) maintained their high levels of child labor.

A second implication of the scatter plots is a clear negative cross-sectional relationship between a county's income level and its use of child labor. Low-income countries use child labor

heavily while high-income countries use child labor little if at all. The cross-sectional relationship is convex, so at first, child labor declines rapidly as per capita income rises. However, as per capita income continues to increase beyond $1,000 (in 1999 prices), additional decreases in child labor participation rates become more modest. In addition, while some countries have eliminated child labor with per capita incomes as low as $1,000, there are other countries with per capita income levels well above $1,000 that still have above-average child labor rates.

The general pattern of declining child labor force participation rates with rising per capita incomes, both across time periods and across countries, has led some observers to suggest that income growth will correct the child labor problem by itself. However, while changes in income are negatively correlated with changes in child labor participation rates, the correlation is only -0.26. Moreover, the persistence of child labor in some of the countries well beyond the $1,000 income threshold also suggests that raising income alone may not be enough to eradicate child labor. Child labor may still persist if there are other factors that raise the value of child time in the labor market, or if there are low perceived returns to alternative uses of child time, particularly in school.

Several studies have shown that child time allocation responds to the strength of the local labor market for children. Levy (1985), Rosenzweig and Evenson (1977), and King, Orazem, and Paterno (1999) found that as local market wages or demand conditions for children rise, the probability of child labor rises. By far the heaviest user of child labor is agriculture. Ashagrie (1997) estimates that 70% of working children are engaged in agricultural activities. The next heaviest users of child labor have much smaller shares, including manufacturing (8.3%), trade

(8.3%) and personal services (6.5%). This suggests that the importance of agriculture in the economy can be used as a proxy for the relative strength of child labor demand in the country.

Child labor and education are alternative uses of time. While most working children also are enrolled in school, evidence presented in the following chapters suggests that working children have less academic success and complete fewer years of school. Consequently, factors that make schooling more productive may cause child labor to decline. Most empirical investigations of the factors influencing whether parents send their children to school find that, other things equal, parental education has a strong positive impact on their children's schooling (Rosenzweig and Wolpin 1994, Grootaert and Patrinos 1999). More educated parents can increase the productivity of their child's time in school, whether by reinforcing what is learned in school, helping with homework, or valuing their children's efforts in school. Many studies have found that mothers' education is particularly important for their children's schooling success (World Bank 2001), but often fathers' education has proven important as well. Regardless of the specific mechanism, it is anticipated that improvements in adult literacy would increase child time in school and thus lower the incidence and intensity of child labor.

Stylized Facts Regarding Child Labor

The previous discussion suggests that the incidence of child labor in a country should be explained by the country's income level, its industry mix, and its adult literacy rate. While past analysis has concentrated on household-level data sets, similar arguments can justify an attempt to explain the variation in child labor participation rates across countries.

A.   Data

The International Labor Organization (ILO) has generated estimates of the employment rates for children aged 10 to 14 by country since 1950. The data are reported in the 1995 Bulletin

of Labour Statistics and are based on survey questionnaires, ILO internal data, and data computed from ILO estimates and projections.[1] Information is available for up to 201 countries per decade from 1950 through 1990.[2] Summary information on child labor participation rates by year and continent is reported in table 1.

The worldwide incidence of child labor has declined steadily since 1950. It has been virtually eliminated in the wealthiest economies of Europe and North America, but these countries already had low levels of child labor in 1950. The biggest improvement was in Asia, where the proportion of working children declined 20 percentage points. The incidence of child labor declined about 10 percentage points in Africa, which nevertheless retains the world's highest current rates of child labor. Child labor declined by 8 percentage points in Latin America, but still exceeded 11 percentage points as of 1990.

The incidence of child labor by continent appears to be inversely related to levels of income. The Penn World Tables report estimates of per capita real income (using a chain-weighted deflator denominated in 1985 U.S. dollars) for many of these countries from 1950 through 1990. Population weighted indices by continent are reported in table 2. World per capita real income rose very slowly between 1950 and 1980 before making some rapid gains in the 1980s. However, those gains were limited to the countries of Asia and the industrialized West. Latin America experienced some rapid gains in per capita real income before 1980, but those gains reversed after 1980. The slowest income gains were in Africa, where child labor incidence is the greatest. The simple correlation between per capita income level and child labor across

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[1] See Ashagrie *Statistics on Child Labor: A Brief Report,* 1993 for details on these estimates.
[2] Information on some countries is spotty, especially for 1950 and 1960. To correct for possible random measurement error, we averaged the data across countries within a region. Random measurement error should be less important in the averaged data as compared with the individual country estimates.

countries is -0.82, suggesting a strong inverse relationship between a country's income level and its incidence of working children.

Statistics on child labor by industry imply that countries relying most heavily on agriculture should have the highest demand for child labor. The World Bank's estimates of agriculture's share of total gross domestic product (GDP) by country is used to index this source of potential demand for child labor in the country. While agriculture's importance in the economy varies considerably across continents, it has fallen less than one percentage point overall. Modest reductions in Latin America and Asia should have contributed to declining child labor, but there also has been no change in the importance of agriculture in Africa. The simple correlation between agriculture's share of GDP and child labor is 0.78, so there is strong evidence that agrarian countries use children's labor services more intensively.

Over the same period, the World Bank reports the share of the adult population (aged 25 years or older) that is considered functionally illiterate. We use this as a measure of parental education. More educated parents are believed to have a stronger taste for schooling and to make child time in school more productive. Between 1970 and 1990, the proportion of the world's adult population that was illiterate fell nearly 14 percentage points. Reductions in adult illiteracy of nearly 20 percentage points were experienced in Africa and Asia. Illiteracy in Latin America fell almost 12 percentage points. Improving parental education levels would be expected to positively influence their children's schooling. Children who spend more time in school would be expected to spend less time at work. Consistent with that conjecture, the simple correlation between the level of adult illiteracy and the incidence of child labor is 0.78.

B.   *Regression Analysis and Simulation Outcomes. World*

Simple correlations support the conjecture that child labor is strongly influenced by a country's level of income, adult literacy, and reliance on agriculture. To evaluate the relative importance of these factors, the following regression model is formulated:

$$CL_{it} = \alpha + \beta_1 \ln (Y_{it}) + \beta_2 [\ln (Y_{it})]^2 + \beta_3 \, AGSHARE_{it} + \beta_4 \, ILLITERACY_{it} + \sum D_t + e_{it}$$

where CL_{it} is the percentage of children aged 10 to 14 in country i and year t who are working; $\ln (Y_{it})$ is the natural logarithm of real per capita GDP; $AGSHARE_{it}$ is agriculture's share of GDP; $ILLITERACY_{it}$ is the adult illiteracy rate; D_t is a vector of yearly dummy variables which control for worldwide time-specific changes in the demand for child labor which could be due to international efforts to combat child labor or to encourage child schooling; and e_{it} is a random error term. The logarithmic form of per capita GDP proved to fit better than the linear form. The quadratic specification in $[\ln (Y_{it})]$ also proved most consistent with the data. The quadratic specification could not be rejected, but higher order terms proved unnecessary.

The regression results are reported in table 3.[3] The full period could only include the quadratic terms in $[\ln (Y_{it})]$ because the information on AGSHARE and ILLITERACY was not available. The full specification could be estimated only over the 1970-1990 period.

The estimates are remarkably stable over time. In fact, the null hypothesis that the coefficients on per capita income are the same for all years could be only weakly rejected over the 1950-1990 period and could not be rejected over the 1970-1990 period.[4] Figure 2 traces the

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[3] The sample of countries used in the regressions differs from those used in Table 1, as only thiose for whom necessary information on per capita incomes, agricultural share and adult literacy are included in the regression sample.   This tends to exclude some of the poorer countries while including a higher share of countries with already low child labor rates in 1950. Consequently, the implied decrease in child labor incidence in the regression sample is smaller than the change reported in Table 1.

[4] The F-statistic is 2.23, which exceeds the critical value at the .05 level but not at the .01 level. The test of stability over the specification including AGSHARE and ILLITERACY could only be conducted over the data since 1970. There, the F-test of the null hypothesis of stable coefficients over time could not be rejected. The F-statistic of 1.37 was well below the critical value of 1.98 at the .05 level of significance.

estimated relationship between per capita income and child labor, allowing variation in the coefficients and constant terms over time. The shape of the relationship hardly varies. One implication of figure 2 is that child labor has decreased worldwide by movement down this stable curve as per capita GDP has risen over time.[5]

The convex shape of the relationship has another implication. As per capita income increases, progressively larger increases in per capita income are necessary to lower child labor by another percentage point. As a consequence, the poorest countries can experience rapid reductions in child labor if they can raise their income levels. In figure 2, for example, a country that is at the lowest quartile per capita income level will experience a decrease of child labor of about 1.4 percentage points for every $100 increase in per capita income. In contrast, a country at the median level of per capita income worldwide will experience a 0.5 percentage point decrease in child labor for every $100 increase in per capita income. In other words, planners can concentrate on fostering economic development and income growth in the poorest countries and expect child labor to fall in response. However, the sensitivity of child labor to further increases in average income decreases, so planners cannot expect to eradicate child labor solely on the strength of further increases in income.

The regression analysis is repeated over the more recent time frame in which there is access to information on AGSHARE and ILLITERACY. The conclusions from the regression in the first column of table 3 stand up. The test of the null hypothesis that the impact of changes in per capita income on child labor is constant over time could not be rejected at standard

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[5] Although developed countries have very low incidence of child labor, this was not the case earlier in their histories when their per capita incomes were more similar to those of developing countries today. For example, in 1910, the labor force participation rate for boys aged 10-13 in the United States was 17%, and it was more than 40% in the states of the Deep South. Over 72% of the working children were employed in agriculture. Interestingly, per capita incomes at the time in the United States would be equivalent to that of countries at the 25th percentile of per capita incomes today, much higher than per capita incomes in most of the developing world.

significance levels. As before, the conclusion is that reductions in child labor follow the progress of the country's path of income growth, but that the relationship flattens out as the country's per capita income rises above the median. In addition, as a country's AGSHARE and ILLITERACY increases,[6] child labor increases significantly. A 10% increase in agriculture's share of GDP increases child labor by about 20%. A 10% increase in adult illiteracy also raises child labor by 20%. The implication is that increasing adult literacy and/or developing the nonagricultural sector of the economy will lower the incidence of child labor, even if child labor is no longer sensitive to income growth.

The pattern of coefficients on the year dummies suggests that until the last decade, child labor was actually on an upward trend worldwide. Absent improvement in per capita income and adult literacy, pervasive trends in child labor would have led to higher child labor force participation by the end of the period than in 1950.

These simple models appear to do a reasonable job of capturing the time series and cross sectional variation in child labor. The quadratic relationship in per capita income explained 67% of the variation in child labor across countries from 1950 to 1990. After adding agricultural intensity and illiteracy, the model explained 80% of the variation in child labor across countries between 1970 and 1990. The parameter estimates allow measurement of how much of the change in child labor can be attributed to changes in the levels of per capita income, agriculture, and illiteracy over time, computed as $\beta_j \, dX_{jt}/dt$. This is directly estimable as the change in the sample mean of the jth variable over the sample period (dX_{jt}/dt) multiplied by its respective

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[6] The share of agriculture in the economy also may be a proxy for the distribution of income. As a rule, agricultural households lag urban households in average income, just as more agrarian countries lag industrialized countries in average income. Poverty rates in rural areas exceed those in urban areas. Consequently, holding per capita income constant, the variance of per capita income would be expected to increase as agriculture's share increases. Consistent with this presumption, measures of income inequality are typically larger in developing than developed countries

coefficient (β_j).[7] The estimates are reported in table 3. They suggest that over the 1950-1990 period, virtually all of the 7 percentage point reduction in child labor participation worldwide can be attributed to increases in per capita income. When the fuller specification is employed over the shorter sample period, increases in per capita income still are shown to explain a reduction of roughly 7 percentage points in the incidence of child labor. Reductions in adult illiteracy also lowered the incidence of child labor by about 2.5 percentage points. AGSHARE explained almost none of the change in child labor over time because the level of AGSHARE did not change much over the period.

C.   *Regression Analysis and Simulation Outcomes. Latin America*

Using the worldwide regressions as a frame of reference, a similar regression methodology was employed over the sample of countries from South America, Central America and the Caribbean. The implications of that analysis are similar to those based on the world sample, although the magnitude of the effects are different in Latin America. Over the full 1950-1990 time period, increases in real per capita income significantly reduced the child labor force participation rate in Latin America. Evaluated at changes in sample means over the 1950-1990 period, increases in real per capita incomes lowered the child labor participation rate by 2.9 percentage points or roughly 40% of the total change. This is smaller than the 7 percentage point drop in child labor that could be attributed to improvements in per capita income worldwide. This is because per capita incomes in Latin America already were at or above the median per capita income in the world, placing those countries in the flatter portion of the relationship between child labor and income shown in figure 2.

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[7] For the estimated impact of changes in per capita income on child labor, the formula is $\beta_1\{\ln (Y_{it}) - \ln (Y_{it-1})\} + \beta_2 \{[\ln (Y_{it})]^2 - [\ln (Y_{it-1})]^2 \}$

By 1970, per capita income in Latin America had further risen relative to world averages, and so child labor would be expected to be even less sensitive to further income growth. In fact, from 1970 to 1990, changes in real per capita income had no effect on average child labor participation in Latin America. However, improvement in adult literacy and reductions in agriculture's share of production had strong negative effects on child labor. The reduction in adult illiteracy is responsible for a 4.2 percentage point reduction in child labor participation compared to the 2.5 percentage point decline worldwide. Reductions in agriculture's share of production lowered child labor by an additional 1.2 percentage points compared to the negligible drop worldwide.

It is important to emphasize that the negligible impact of improvements in average per capita income on child labor in Latin America over the 1970-1990 period does not imply that income is unimportant. In fact, holding average income constant, higher levels of illiteracy and agricultural production suggest a more unequal income distribution. Consequently, the large effects of adult illiteracy and agricultural on child labor may be due to a larger share of low-income households within a given country. Therefore, while general increases in average income levels in a country may not affect child labor, policies that raise incomes at the lower end of the distribution still might have some effect. However, as the next chapter will demonstrate, child labor is still practiced at even the upper end of the income distribution in these countries. Consequently, income transfer programs alone will not eliminate child labor in Latin America.

Conclusions

The preponderance of evidence suggests that child labor is strongly tied to the level of household income. In fact, increases in per capita incomes can explain almost all of the reductions in worldwide child labor since 1950. However, child labor becomes less responsive to

additional increases in per capita income as the level of per capita income rises. In Latin America, where average per capita income exceeds the world median level, it may take a very large increase in average income, and consequently, a very long time to eliminate child labor through income growth alone.

The sensitivity of child labor participation rates to adult literacy rates and the share of agriculture in total production suggest other avenues by which policy could reduce child labor. Policies that lower the value of child time at work, such as truancy laws or child labor prohibitions could be sufficient, except that they are nearly impossible to enforce in the informal labor markets in which child labor occurs most frequently. Alternatively, policies that raise the value of child time in school relative to work, such as tying income transfers to child attendance or schooling success could decrease incentives to send children to work. Adult literacy programs or other outreach programs that advertise the importance of education may lead parents to place greater value on their children's schooling. Much of this book will be devoted to reviewing evidence of factors that would affect the success of such policies and how they have worked in practice.

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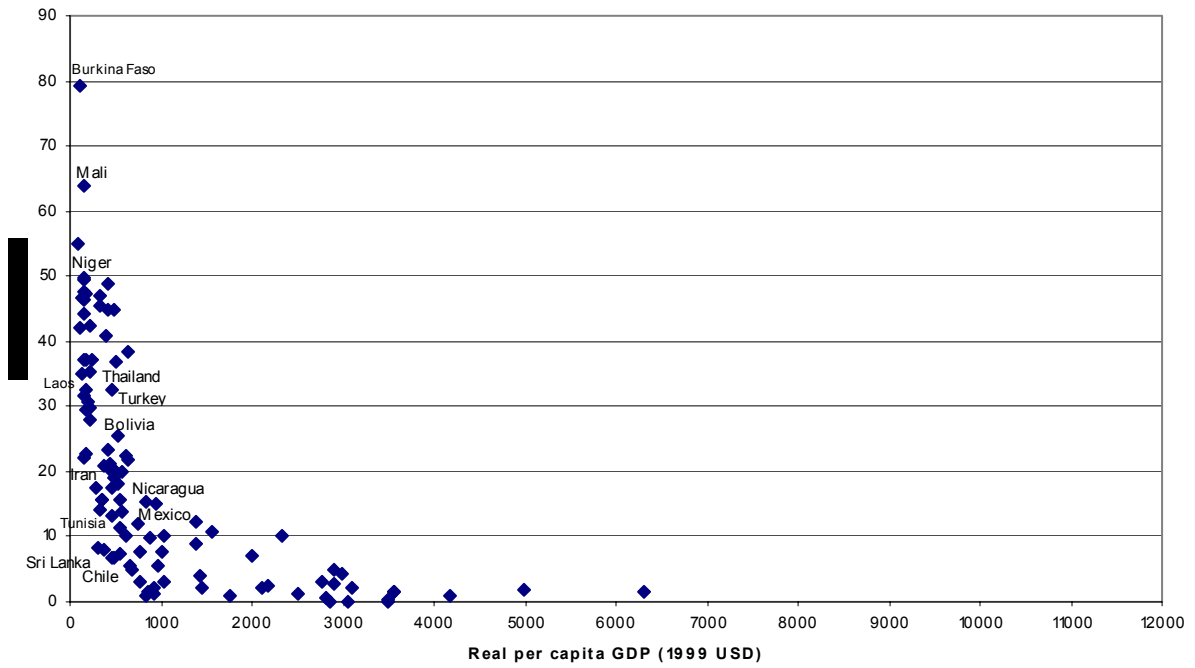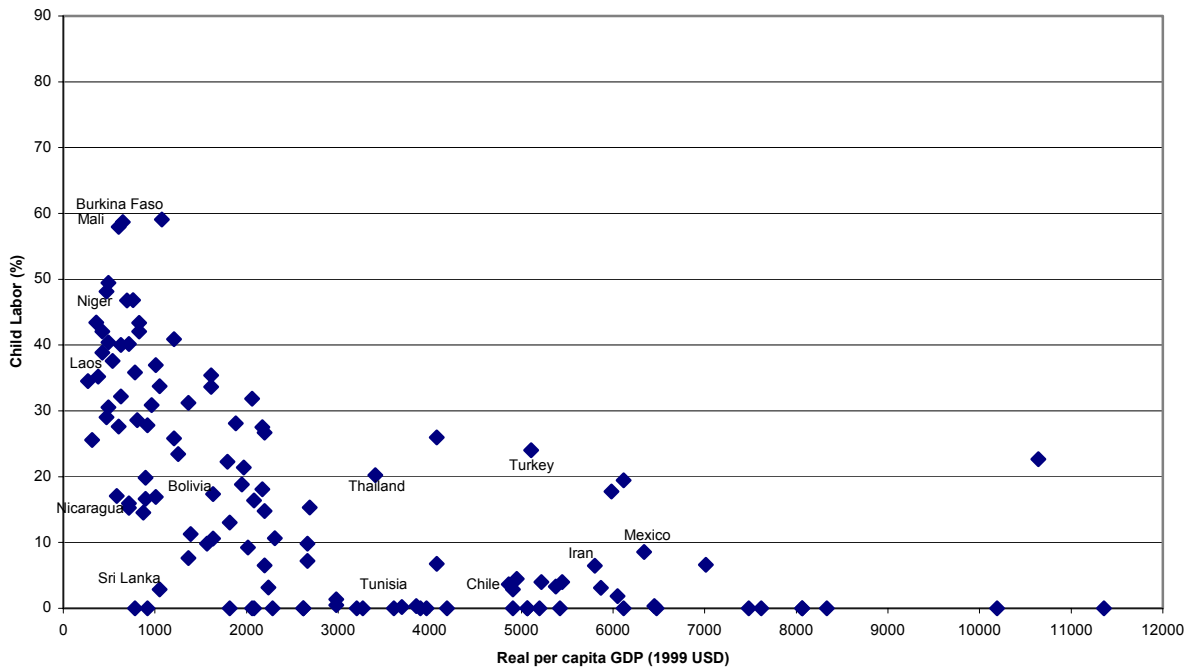Figure 1a: Real Per Capita GDP and Child Labor, 1960.

Figure 1b. Real Per Capita GDP and Child Labor, 1990.

Figure 2: Child labor vs. real per capita GDP 1950-1990
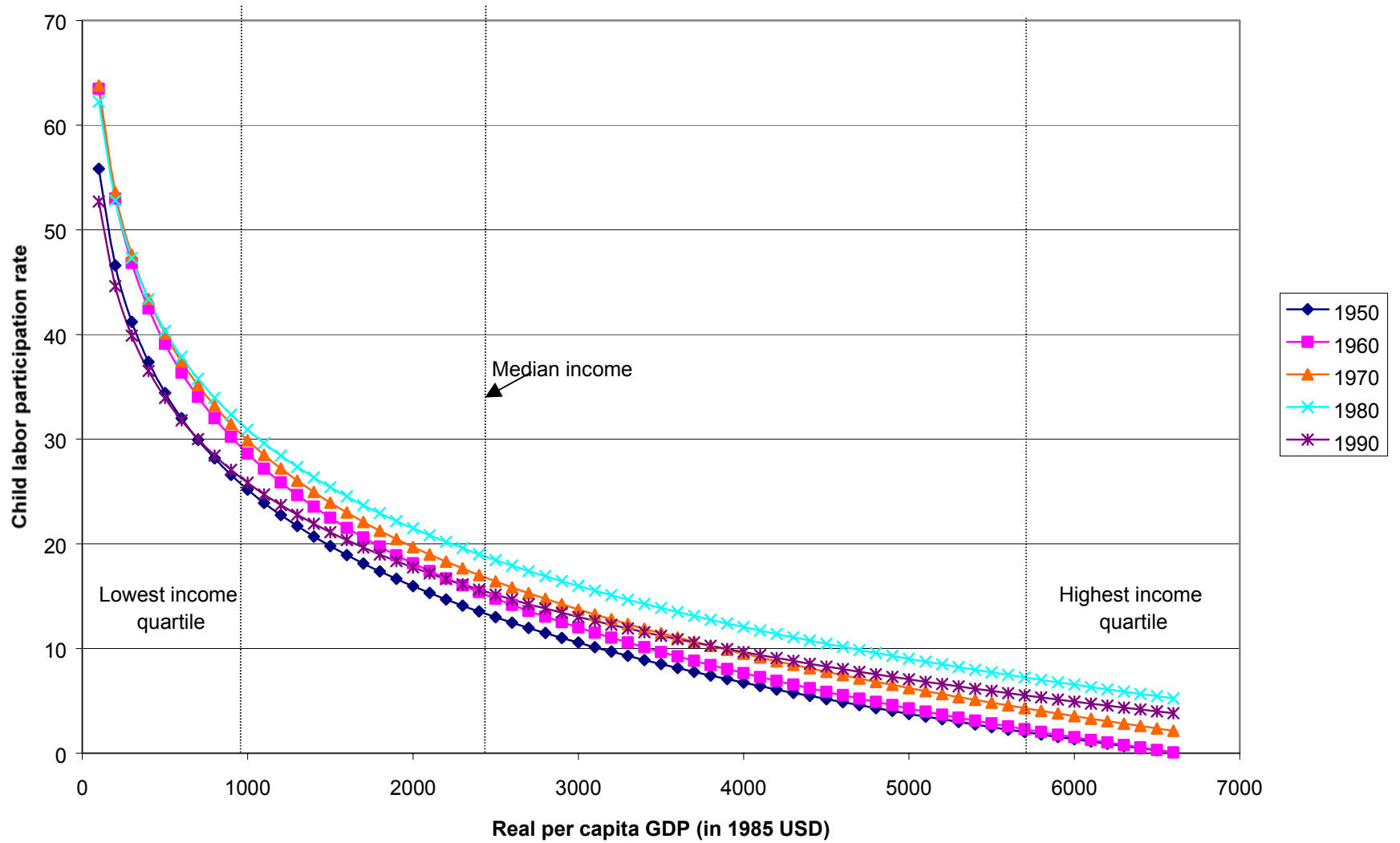**Based on estimates reported in column 1 of Table 3**

Table 1. Child Labor Participation by Continent (%).

Continent	1950	1960	1970	1980	1990
World	27.6	24.8	22.3	19.9	14.7
Africa	38.4	35.9	33.1	31.0	27.9
Asia	36.1	32.3	28.4	23.4	15.2
Latin America & Caribbean	19.4	16.5	14.6	12.6	11.2
North America, Western Europe and Australia	6.1	3.8	2.1	0.5	0.1

Sources. ILO (1996) and author's calculations based on Bulletin of Labour Statistics, 1995 I-IV, ILO and Penn World Tables.

Table 2. Per Capita GDP, Agricultural Share of GDP and Illiteracy, by Year and Continent.

Continent	1950	1960	1970	1980	1990
World					
Per capita GDP[a]	2559	2225	2974	2968	4023
Agriculture Share[b]			9.5	11.0	8.7
Illiteracy[c]			41.1	36.1	27.3
Africa					
Per capita GDP[a]		824	1050	1417	1449
Agriculture Share[b]			23.1	18.9	20.9
Illiteracy[c]			67.9	57.6	46.8
Asia					
Per capita GDP[a]		876	1286	1698	2192
Agriculture Share[b]			24.6	19.1	17.9
Illiteracy[c]			51.2	41.4	32.8
Latin America & Caribbean					
Per capita GDP[a]	1981	2340	3215	4541	4132
Agriculture Share[b]			12.8	10.1	7.2
Illiteracy[c]			27.2	21.1	15.3
North America, Western Europe and Australia					
Per capita GDP[a]	5506	7141	10132	10953	13756
Agriculture Share[b]			1.3	2.7	1.4
Illiteracy[c]			1.3	1.7	0.7

[a] Author's calculations based on GDP per capita in 1985 US dollars.
Source: Penn World Tables.
[b] Author's calculations based on agricultural share of GDP.
Source: World Bank and Penn World Tables.
[c] Author's calculations based on adult illiteracy rates computed by the World Bank

Table 3. Regression Analysis of Child Labor Force Participation Rates by Country 1950-1990.

Variable	World Sample		Latin America Sample	
	1950-1990	1970-1990	1950-1990	1970-1990
ln Y	-59.85**	-63.9**	-8.48**	-.076
	(9.97)	(8.16)	(6.62)	(.03)
$(\ln Y)^2$	2.97**	3.55**		
	(7.71)	(7.43)		
AGSHARE		.18**		.21*
		(3.37)		(1.98)
ILLITERACY		.18**		.35**
		(6.52)		(5.32)
D_{50}	-1.47		5.72**	
	(.89)		(2.29)	
D_{60}	.62		1.37	
	(.45)		(.59)	
D_{70}	1.96	-.39	2.60	-1.09
	(1.47)	(.31)	(1.15)	(.62)
D_{80}	3.17**	2.22*	2.80	.07
	(2.42)	(1.93)	(1.25)	(.04)
Constant	298.2**	285.6**	75.4**	-.20
	(12.9)	(32.6)	(7.31)	(.01)
R^2	.67	.80	.36	.57
N	547	285	122	63
Observed Change in CLFP[a]	-7.05	-8.65	-6.83	-0.95
$\beta_i (dX_{it}/d_t)$ [b]				
ln Y	-7.11	-7.22	-2.89	-.01
AGSHARE		-0.15		-1.17
ILLITERACY		-2.49		-4.17
$\sum_i \beta_i (dX_{it}/d_t)$ [c]	-7.11	-9.83	-2.89	-5.35

t-statistics in parentheses.
*significance at the .10 level. **significance at the .05 level.
[a]change in population-weighted child labor force participation rate.
[b]change in population-weighted mean of the regressor times its respective coefficient.
[c]change in child labor attributable to changes in real per capita income, agriculture share, and adult illiteracy rate.