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Distinguished Lecture

Underinvestment in Education: How Much Growth has Pakistan Foregone?

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INTRODUCTION

In this paper we address the following question: How great have been the costs to Pakistan, in terms of income growth foregone over the last three decades, of relatively low investments in education, and especially in the education of girls? We use the results of an econometric analysis of the relationship between education and economic growth in a cross-section of countries to compare Pakistan's actual rate of growth and recent levels of output with what they might have been had Pakistan achieved education enrollment rates observed in three rapidly growing East Asian economies: Indonesia, Republic of Korea[1] and Malaysia. Our analysis suggests that foregone income growth has been large. For example, if female enrollment in primary school had been as high as male enrollment in 1960–i.e. 46 percent instead of 13 percent, we estimate that Pakistan's 1985 per capita income would have been more than 15 percent greater than it was. (In 1960, male enrollment rates in primary school in Indonesia, Korea and Malaysia were 58, 83 and 89 percent, respectively.)

We recognise that education investments have social as well as economic benefits, e.g. the lower infant mortality rates of better-educated mothers, and that gains in income growth alone are a poor measure of overall development. However, we believe it is useful to quantify the opportunity cost of low investments in education in terms of foregone income, to complement recent work on the social benefits of education and the social losses associated with low education, especially of

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[1]Henceforth, the Republic of Korea will be referred to as Korea.

girls.[2]

In the first section of this paper, we present the results of work comparing Pakistan's education levels with other countries. In Section II, we discuss briefly the theory and recent findings linking education and growth and the role of education in the growth strategy of the highly successful East Asian economies. In the subsequent sections, we present new analysis linking education to economic growth; and quantify the costs to Pakistan of its history of low overall enrollments, and low enrollments of girls.

I. PAKISTAN EDUCATION ENROLLMENTS IN INTERNATIONAL PERSPECTIVE

Table 1 shows data on primary and secondary enrollment rates for Pakistan and three comparator countries of East Asia for the period 1960–85 and GDP per capita levels and growth rates for the same period. In all four countries, income and enrollment rates have grown substantially–though both grew more slowly in Pakistan than in the other three countries.

To assess systematically Pakistan's performance compared to these East Asian countries, we examine the four countries' experience relative to all developing countries. Figures 1A and 1B present a stylised summary of the results of regressing primary and secondary enrollment rates on per capita national income for more than 90 developing countries for the years 1965 and 1987.[3] In Figure 1A the focus is on primary enrollments. As expected, the average relationship between per capita income and enrollment rates is upward sloping. The figure plots the residuals for Pakistan and for our East Asian comparators. In 1965, and again in 1987, Pakistan's primary enrollment rate is well below the level predicted for countries at the Pakistan level of income while the enrollment rates for Indonesia, Korea and Malaysia are near, or substantially above, the predicted level. While primary enrollment rates in Pakistan increased over the period from 40 to 52 percent, they did not close the gap with our East Asian comparators, all three of which achieved universal primary education during the period.

[2]The social returns to education of girls were explored in a paper presented at these meetings one year ago; see Summers (1992). We also ignore in this paper the effects of higher investments in education on long-run distribution of income, though our work on East Asian economies show that the distributional effects are positive (i.e. higher investments in education increase income equality).

[3]The analysis we describe was conducted by J. Behrman and R. Schneider and presented in two papers, Behrman and Schneider (1991) and Behrman and Schneider (1992). The regressions control for a polynomial in average per capita income in the relevant year. The authors used per capita GNP at official exchange rates as the measure of income. The Barro data base, which we use for our growth equations, has purchasing-power-parity measures of income per capita.

Table 1

Enrollment Rates, GDP per Capita, and GDP per Capita Growth
Pakistan, Indonesia, Malaysia, and Korea: Selected Years

Country	Primary Enrollment Rates				Secondary Enrollment Rates			Real GDP per capita			Growth of per capita GDP	
	1950	1960	1970	1985	1960	1970	1985	1960	1980	1985	1960–1985	1980–1985
Pakistan	16	30	44	53	11	14	24	$558	$989	$1,153	2.9%	3.1%
Indonesia	29	67	75	118	6	15	39	$493	$1,063	$1,255	3.8%	3.4%
Malaysia	43	96	91	99	19	34	53	$1,103	$3,112	$3,415	4.6%	1.9%
Korea	53	94	105	94	27	42	95	$690	$2,369	$3,056	6.1%	5.2%

Source: Barro data set (from Summers and Heston, 1986; United Nations; The World Bank; Bank's data base {1979}; and some other sources). Real GDP data are from Summers and Heston (1986) and are based on their estimates of purchasing power parity across countries. They are thus different from World Bank published data, which use nominal exchange rates. World Bank (ANDREX data base) values for 1985 GDP per capita (in 1980 dollars) are $342, $611, $2003, and $2298 for Pakistan, Indonesia, Malaysia, and Korea respectively.

Note: In this paper, we use 1980 secondary enrollment rates in one regression (Equation (2)). These rates are from the World Bank data base ANDREX. They are 14 percent, 29 percent, 48 percent, and 76 percent for Pakistan, Indonesia, Malaysia, and Korea respectively. Barro's figure of 53 percent for primary enrollment in 1985 (Pakistan) is higher than that used by the World Bank (48 percent in 1985 in the ANDREX data base, and 38 percent for 1989 in the 1992 World Development Report). These differences are apparently related to different definitions.

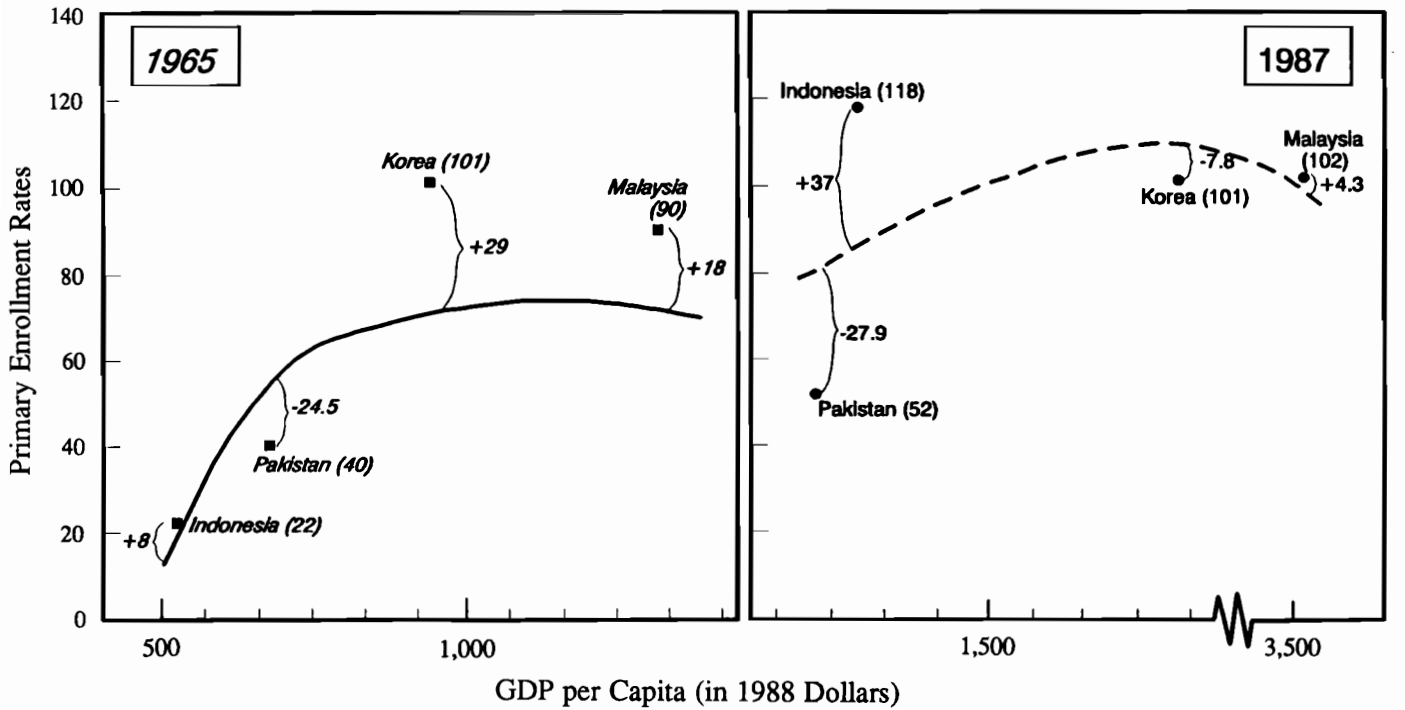


Fig. 1A. Cross Country Regression for Primary Enrollment Rates, 1965 and 1987.

The story with regard to secondary schooling is somewhat different. As Figure 1B illustrates, in the mid-60s the secondary enrollment rate in Pakistan was actually a bit higher than predicted. However, despite increasing by more than 50 percent (from 12 to 19 percent), by 1987 Pakistan's enrollment rate was below the regression line: other developing countries at Pakistan's income level had increased their secondary enrollment rates at a still faster pace.

Pakistan's relative performance at the primary and the secondary levels is similar in one key respect. At both levels, enrollment rates are well below the rates achieved by Indonesia, Korea and Malaysia. In 1987 the secondary enrollment rates of these three countries are above the levels predicted and from two to four times the Pakistani level.

Table 2 shows male and female enrollment rates across the four countries, beginning in 1960. The table indicates that Pakistan is also behind–and not catching up–with respect to female rates.

Figures 1C and 1D depict the relationship between per capita GNP and the gender gap (male minus female) in enrollment rates at the primary and secondary levels across the larger sample of countries. In these figures, the data points for Pakistan lie well above the regression lines. Unfortunately, in this case being above the line signifies relatively poor performance. The figure indicates that relative to other countries at its level of income, Pakistan made virtually no progress between 1965 and 1987 in reducing the gap between boys and girls at either the primary or the secondary levels. The gap tends to decline as incomes increase, hence the downward slope of the regression lines. Nevertheless, in our East Asian comparators these gaps are somewhat below predicted levels and substantially below the levels observed in Pakistan.

Why has Pakistan's performance in provision of opportunities for basic education been so much weaker than that of Indonesia, Korea or Malaysia? One possible explanation could be–but we think is not–the difference among these countries in the educational legacy of the colonial period. As Table 1 shows, in 1950 Pakistan was already well behind Korea in enrollment rates. On the other hand, it was much closer to Indonesia in 1950 in primary enrollment and was ahead in secondary enrollment probably through much of the decade of the 1960s. High secondary compared to primary enrollment rates probably implied less of a supply constraint in terms of teachers–a short-term advantage for Pakistan early in the period. In fact, the rapid increases in primary enrollment rates in Indonesia and Malaysia–especially from 1950 to 1960–mean that differences in rates of growth of the educational system since independence are as or are more important than initial differences in explaining the current gap between Pakistan and its East Asian neighbours.

Table 2

Male and Female Enrollment Rates
Pakistan, Indonesia, Malaysia, and Korea 1960, 1970, 1985

	Pakistan		Indonesia		Malaysia		Korea	
Country	Male	Female	Male	Female	Male	Female	Male	Female
Primary								
1960	46	13	86	58	108	83	99	89
1970	57	22	87	73	91	84	104	103
1985	61	34	120	114	101	100	96	98
Secondary								
1960	18	3	10	3	25	13	38	14
1970	20	5	21	11	40	28	50	32
1985	24	10			53	53	92	88

Source: World Bank Data Base ANDREX. The source for enrollment data is different from that used by Barro, so that the enrollment numbers are not directly comparable to those in Table 1. (Differences by source arise due to different definitions, e.g. of age group included in the denominator.)

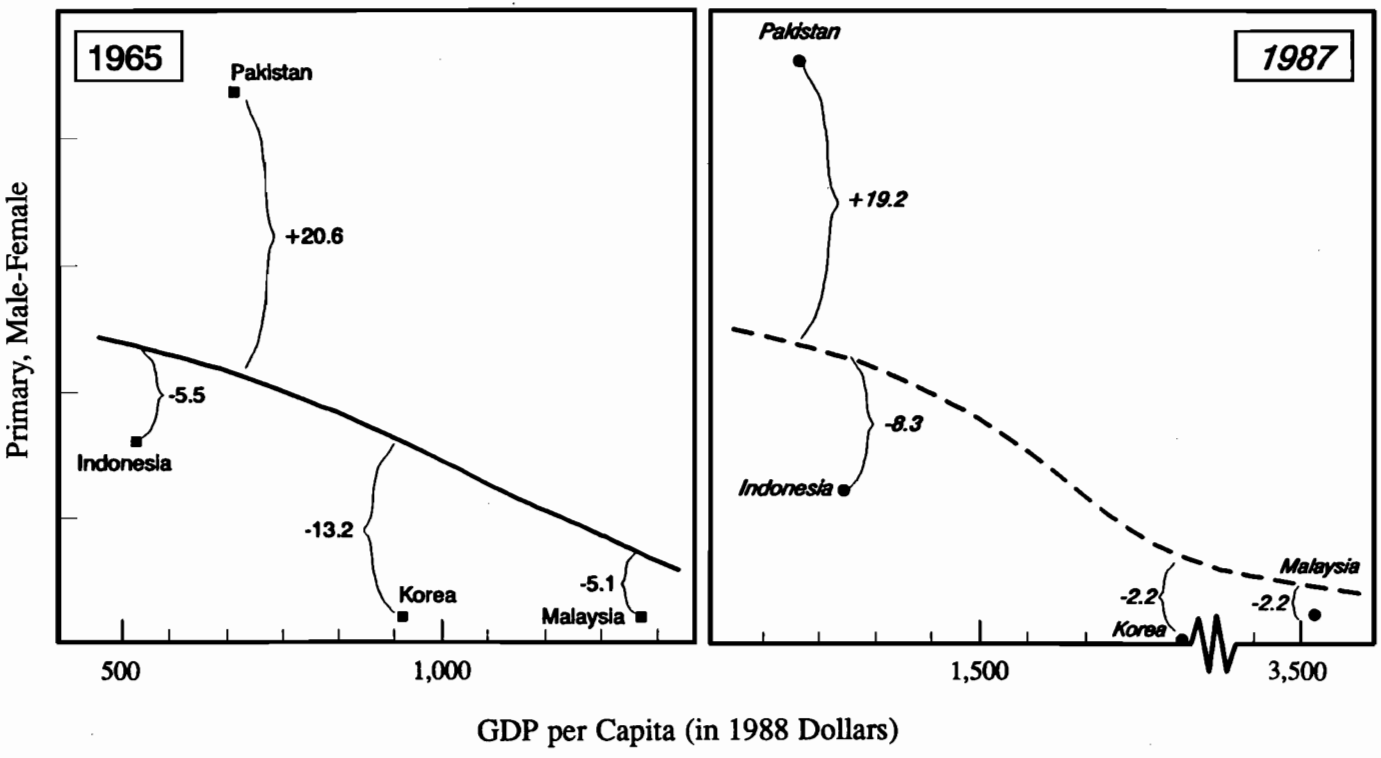


Fig. 1C. Cross Country Regression for Gender Gap in Primary Enrollment Rates, 1965 and 1987.

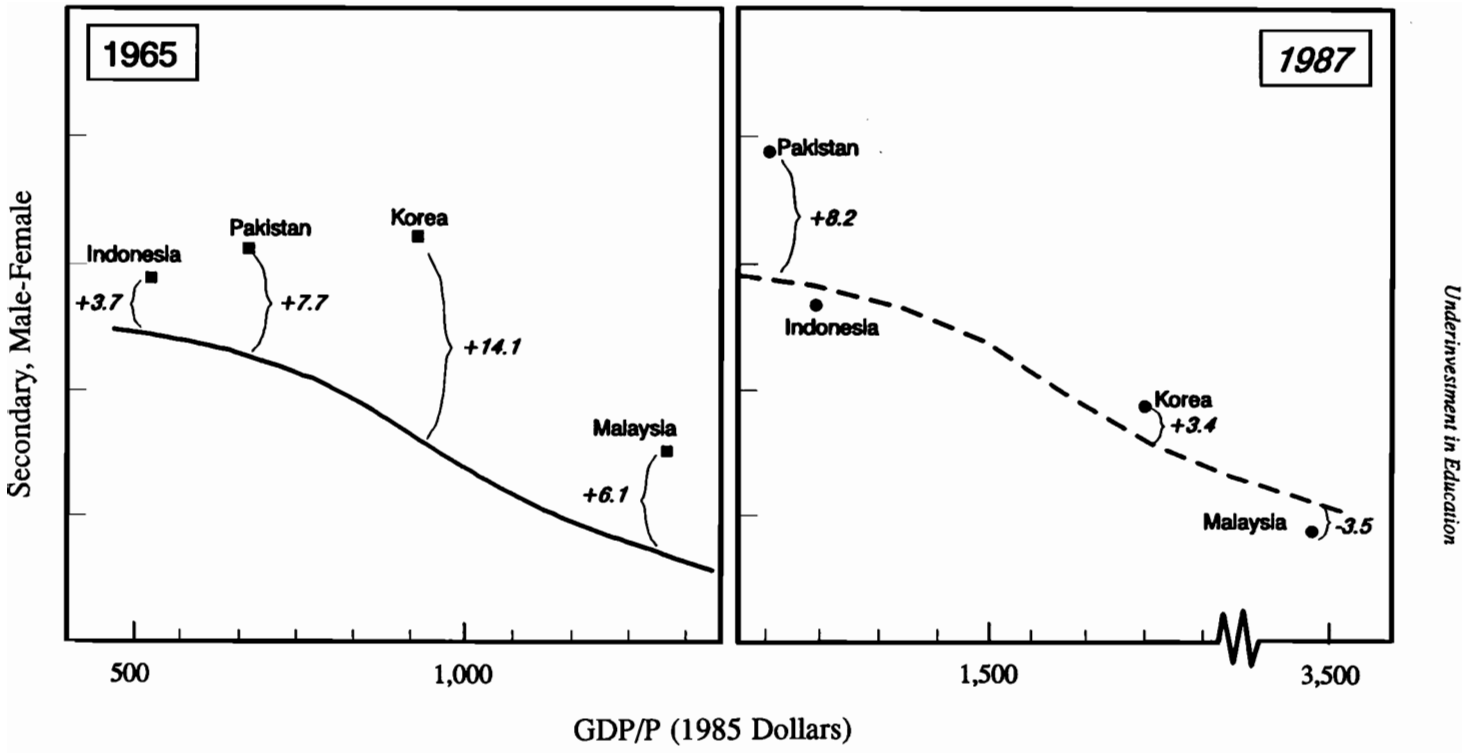


Fig. 1D. Cross Country Regression for Gender Gap in Secondary Enrollment Rates, 1965 and 1987.

More important than initial conditions has been the level of commitment of governments to education and particularly to basic education.[4] The share of public expenditure on education allocated to basic education has consistently been higher in East Asia than in other regions. (See Table 3.) By giving priority to expanding the base of the educational pyramid, East Asian governments have stimulated the demand for secondary and higher education, while relying on the private sector to satisfy that demand. As Table 3 indicates, the share of public expenditure devoted to primary and secondary education was 91 percent in Indonesia, 89 percent in Korea and 84 percent in Malaysia in 1985-86. In Pakistan the share of public expenditure allocated to basic education in the same year was 73 percent. Given low enrollment and the larger size of the primary school age cohort in Pakistan compared to the higher education cohort, Pakistan's relative allocation to basic education is even smaller than it appears. In contrast to any initial disadvantage Pakistan had in the 1950s, the amount and allocation of public expenditures on education is, of course, a policy instrument.

In addition, demography has made a difference. East Asia embarked early on the demographic transition while Pakistan continues to have a rate of population growth similar to those observed in Africa. During the eighties, the population growth rate was 1.8 percent in Indonesia, 1.1 percent in Korea and 2.6 percent in Malaysia. In Pakistan it was 3.1 percent. More striking, for the period 1985–2000 the population age 6–11 is forecast to grow at the following rates: 0.6 percent in Indonesia, –0.3 percent in Korea, 1.1 percent in Malaysia and 3.0 percent in Pakistan.

As a result, compared to the East Asian countries, Pakistan has to run just to keep enrollment rates in the same place. Table 4 shows that had Pakistan's school-age population grown at the Korean rate in 1985, the government could have spent more than 40 percent less than it did (1 percent rather than 1.8 percent of GNP) to keep enrollment constant–or could have enrolled up to 40 percent more children than it did–implying as much as a 50 percent increase in enrollment rates of smaller cohorts.[5]

[4]The share of government expenditures that goes to education also matters, of course. Pakistan's share is also low compared to other countries, particularly the East Asian countries. Government expenditure on education, expressed as a percentage of GNP, was used as an explanatory variable in a cross-country regression in which expected years of schooling of the school-age cohort (essentially an aggregate of enrollment rates) is the independent variable. For a sample of 15 Asian and Latin American countries, the expenditure variable was insignificant. The authors conclude "this startling result arises because countries differ in the way their education systems are organised and financed." See Tan and Mingat (1992).

[5]This does not necessarily mean that in Pakistan high fertility at the household level is a constraint on schooling. Sathar's findings (1992) suggest the contrary.

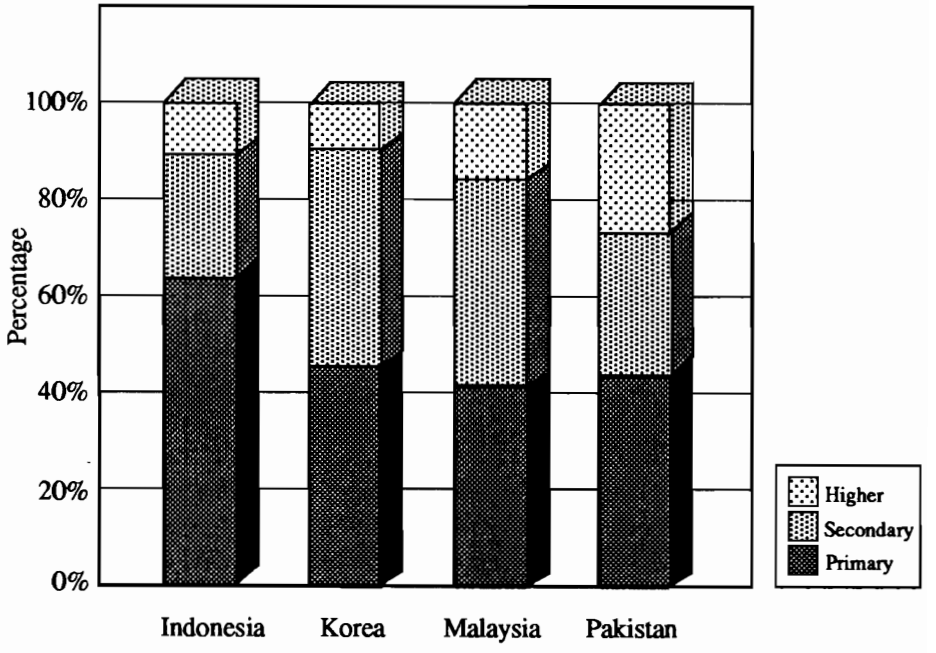
Table 3

The Distribution of Public Expenditure across Levels of Education, 1965, 1985-1986

Country	1965			1985-86		
	Prim.	Sec.	High	Prim.	Sec.	High
Indonesia	–	–	–	63	28	9
Korea	67	22	11	48	41	11
Malaysia	–	–	–	42	42	16
Pakistan	50	27	23	44	29	27

Source: World Bank data.

Note: Original data took into account other educational categories such as vocational training. The above figures have been adjusted to exclude these other categories. Figures have also been rounded.



Share of Public Spending on Education by Level, 1985-1986

Table 4

Potential Impact on Educational Expenditure of Reduced Fertility

Pakistan	1975	1980	1985
Expenditure on Primary + Secondary Education/GNP (Percent)	1.6	1.4	1.8
Ratio of School Age Population to Pakistan's:			
Korea	0.84	0.77	0.57
Malaysia	0.93	0.87	0.86
Indonesia	0.91	0.93	0.87
Expenditure on P+S/GNP in Pakistan, had Growth Rate of School-age Population been Equal to:			
Korea	1.34	1.07	1.02
Malaysia	1.48	1.21	1.54
Indonesia	1.45	1.30	1.56
Percentage of GNP that would have been Saved in Pakistan, had Growth Rate of School-age Population been Equal to:			
Korea	0.3	0.3	0.8
Malaysia	0.1	0.2	0.3
Indonesia	0.2	0.1	0.2

II. EDUCATION AND ECONOMIC GROWTH: THE EAST ASIAN ECONOMIES

What are the implications of Pakistan's surprisingly poor performance in education for its economic growth performance? To examine this question requires that we first consider why, at the country level, education has contributed to economic growth.

Over the past fifty years, in research on the transformation of low into high income countries,[6] an increase in the educational attainment of the population has consistently emerged as an apparently essential feature of economic development. In fact, this is what human capital theory, the theory of investment in people, would predict: education augments cognitive and other skills which, in turn, augment the

[6]Clark (1940) and Kuznets (1966) were pioneers in the empirical search for uniformities in the process of economic development. Chenery and Syrquin (1975) provided a comprehensive description of the structural changes that accompany the growth of developing countries and analysed their relations.

productivity of labour.[7]

Of course, a positive correlation between school enrollment ratios and per capita output in a cross-section of countries, or within the same country over time, does not establish causation. Education could simply be a luxury consumer good that is increasingly demanded as incomes rise. The human capital interpretation of the correlation, that education is an investment good that increases economically productive skills and economic growth, is by now, however, based on a firm foundation of microeconomic evidence.

Studies of rates of return to education in more than 40 countries all report returns to education that are competitive with returns to investment in physical capital.[8] In these studies, benefits are measured by the increments to individual earnings associated with increments to schooling. Since time in school is an input into the process of augmenting skills, not an output, this approach leaves open the possibility that some other input, such as natural ability, which schools screen for but do not enhance, is actually responsible for increasing labour productivity and earnings. But there is a new generation of studies that measures the relationship between cognitive outputs of schooling and earnings, while controlling for ability and other inputs. These studies have confirmed the human capital interpretation of the education-wage relationship.[9] The relationship between individual schooling and higher wages and earnings is in fact mirrored at the macro level by the established link between the average education of the work force in a country in some initial period and the country's subsequent rate of economic growth [see, for example, Barrow (1992)]. The relationship is not surprising.

A larger stock of human capital facilitates technological progress or, for a country that is not on the technological frontier, acquisition of technological capability.[10] "A follower country with more human capital tends to grow faster because

[7]When announcing Gary Becker as the winner of the 1992 Nobel Prize in Economics, the committee cited, as one justification, his seminal contribution to the theory of human capital. See Becker (1964). Another pioneer of human capital theory, Theodore Schultz, was also awarded a Nobel Prize in 1979. See Schultz (1961).

[8]See Psacharopoulos (1981).

[9]See, for example, Boissiere, Knight and Sabot (1985) and Glewwe (1990). In addition to the screening critique of the human capital interpretation, there is the credentialist critique in which the link between earnings and labour productivity is challenged. If earnings, and the premium to education, are administratively determined, then the correlation between the two tells us little. However, in agriculture, production functions which directly measure the impact of education on productivity have been estimated, and these tend to show a strongly positive relationship. See Jamison and Lau (1982). Behrman and Birdsall (1983) show that some of the apparent return to years of schooling is in fact a return to better quality of schooling among those who attend school longer; however, these and other critiques of the standard approach to estimating rates of return to schooling still imply high private (and social) returns that compare well with returns to physical investment.

[10]See Romer (1990) and Nelson and Phelps (1966).

it catches up more rapidly to the technological leader."[11] And rates of return to human capital may actually be increasing over some range, due to spillover benefits – i.e. when more education of one worker makes an entire group of workers more productive.[12]

Below we compare Pakistan to three East Asian economies, Korea, Malaysia and Indonesia, to illustrate the effects to the country level of human capital investment. In nearly all of the rapidly growing East Asian economies (including Hong Kong, Singapore and Taiwan, China, with Thailand being a notable exception), the growth and transformation of systems of education and training over the last three decades has been as dramatic as the economic changes that were simultaneously occurring.[13] The quality of education children received improved at the same time that the quantity of schooling, and of training in the home, markedly increased, resulting today in cognitive skill levels among secondary school graduates in some East Asian countries comparable to, or higher than, those of graduates in high income countries.

Most developing countries in the postwar era have embraced some more or less explicit strategy for growth–e.g. relying more or less on the market or on government-led investments. Growth policy is quite distinct from conventional macroeconomic management. With the latter, the government is largely concerned with muting the business cycle and its effects on inflation, unemployment and the balance of payments, and with easing adjustments to external shocks. With the former, the government uses mainly microeconomic instruments in a coherent way to alter the structure of the economy and its potential growth path, making it at the margin, for example, more export-oriented, more capital-demanding, more reliant on private initiatives, etc.

In the successful East Asian economies, two well-known dimensions of growth policy were adoption of measures to increase savings and investment and to accelerate the shift of resources into the production of manufactured goods for export. This approach to growth resulted in rapid increases in both the demand for labour and eventually in the skill intensity of labour demand. The small size and poor endowments of natural resources, especially in Korea, Hong Kong, Singapore, and Taiwan, China, probably helped inspire the emphasis on labour demanding exports–and on education to ensure and maintain labour productivity and export competitiveness. (Richer natural endowments may similarly help to explain the relative neglect, at least until recently, of human resource investments in Thailand.)

With export-driven growth, the demand for education grew–as parents

[11][Barro (1991), p. 409.]

[12]See Lucas (1988) and Becker, Murphy and Tamura (1990).

[13]The following discussion is based largely on Birdsall and Sabot (1993).

observed high returns to education in both urban and rural labour markets, and as household incomes grew. In one sense, the resulting increases in education were part of a virtuous circle of increasing demand for skilled labour and increasing returns to skills in the labour market. At the same time, it is clear that the governments of these countries played a strong supporting role in increasing supply of public education–and permitting expansion of private education. In effect, the governments of most East Asian countries made a high rate of investment in human capital, and in particular, in basic education and the acquisition of technological capability, an implicit third dimension of their development strategy. It is possible, of course, that the various components of this growth strategy appear more coherent *ex post* than they were, in fact, *ex ante*. For example, the impetus for increased public investment in education may have been the political gains to be derived from responding to strong private demand, rather than any strategic government vision. However, there is little doubt, as we show below, that educational investments were high, given income levels–and *ex post*, were critical in enabling these economies to achieve their sustained high rates of productivity and income growth.

While human capital accumulation may be a necessary condition for sustained rapid economic growth, it certainly is not a sufficient condition. Egypt, the Philippines, the former Soviet Union and Sri Lanka are prominent examples of countries that have had enrollment rates well above the average and subpar rates of growth of per capita income and wages. The combination of high enrollments and low rates of growth of output and wages makes apparent that the utilisation of human capital, in activities that yield high returns to the prior investment in education and training, is as important to growth as the accumulation of human capital.

Two conditions must be fulfilled for a growing supply of educated labour to be utilised in high return activities: First, there must be rapid growth of labour demand and, in particular, of demand for skilled labour. Second, there must be an efficient, flexible and responsive market for labour to ensure that workers are employed in jobs in which their skills are most productively utilised. Neither condition was fulfilled in Egypt, the Philippines or the former Soviet Union, where, among other problems, poor macroeconomic management at various periods discouraged investment in what might have been efficient, skilled-labour demanding activities. In East Asia both conditions appear to have been fulfilled. The growth path in East Asia has tended to be labour and skill demanding; and labour markets appear to have performed better in East Asia than in other developing regions.[14]

While not in the East Asian league, Pakistan's growth performance (2.9 percent per year over the period 1960–85–see Table 1) has been quite respectable

[14]See Birdsall and Sabot (1993).

and has been slightly higher in recent years. This suggests that, in contrast to the countries in which high levels of investment in human capital did not have a growth payoff, in Pakistan the demand-side and labour market preconditions for efficiently utilising an increased supply of human capital have been in place.[15] Hence, it appears sensible to ask how much faster growth would have been had Pakistan invested in human capital at the higher rates prevailing in East Asia.

III. THE BARRO MODEL AND SOME EXTENSIONS

In this section, we quantify the effect on Pakistan's income growth of its lower rates of investment in education over the last three decades. First, let us consider basic results reported by Barro (1991). Robert Barro has recently joined the ranks of those searching for uniformities in the process of economic growth. He estimates equations to explain variation among 98 countries in the growth rate of real per capita income over the period 1960–85. Among the explanatory variables, he includes the level of per capita gross domestic product (GDP) at the start of the period and education enrollment rates in 1960, a crude proxy for the initial stock of human capital.[16] His key finding is that the growth rate is positively related to initial human capital and negatively related to initial per capita GDP. For a given quantity of initial human capital, a poor country tended to grow faster than a rich country, so that incomes were converging over the period among countries with similar levels of education. To put it another way, poorer countries grew faster over the period than richer countries–but only if their initial human capital was greater than expected given their initial income.[17]

The relevant coefficients from Barro's Equation (1)[18] are

[15]In this respect, Pakistan is more like Thailand, where growth has been rapid despite underinvestment in human capital, than it is like Egypt. For an assessment of the constraints on future growth in Thailand imposed by a scarcity of human capital, see Birdsall and Sabot (1992).

[16]See Barro (1991).

[17]Barro does not include physical investment in his growth equation, on the apparent grounds that it is endogenous. He estimates an equation for private investment (as a ratio of GDP) as a function of primary and secondary enrollments, both of which are significant in explaining private investment. This suggests that greater investment in human capital in Pakistan would have and would in the future lead to higher levels of private investment. Our simulations below are based on the premise that in fact in the medium run, levels of private investment are endogenous in the growth process.

[18]The full equation appears as Equation (1) of Table A.3. The other explanatory variables are average (1970–1985) ratio of real government consumption (exclusive of defense and education) to real GDP; number of revolutions and coups per year (1960–85 or subsample); number of assassinations per million population per year (1960–85 or subsample); deviation of the 1960 purchasing power parity value for the investment deflator from the sample mean. The definitions of all variables are listed in Table A.1. Descriptive statistics appear in Table A.2. Table A.4 provides the basic data for our four comparator countries used in the Barro regression.

$$GR6085 = 0.0302 - 0.0075\ GDP60 + 0.0250\ PRIM60 + 0.0305\ SEC60 \quad (1)$$
$$(6.2) \qquad (4.46) \qquad (3.86)$$
$$N = 98 \quad R^2 = .56$$
(t-statistics in parentheses)

where the dependent variable, *GR*6085, is the annual average growth rate of real per capita gross domestic product between 1960 and 1985 and the independent variables are GDP in 1960 and primary and secondary enrollment rates in 1960.

The average annual growth rate in per capita GDP between 1960 and 1985 is strongly negatively related to initial GDP per capita and strongly positively related to the human capital proxies. All else equal, had per capita real GDP been $1000 higher in 1960, growth over the following 25 years would have averaged 0.75 percentage points per year lower. Had primary- or secondary-school enrollment rates respectively been 10 percentage points higher in 1960, growth would have averaged 0.25 or 0.30 percentage points per year higher.

There are two shortcomings of these results however. First, they shed no light on the possible impact in different countries of different levels of investment in education since 1960. The results thus seem to imply that low income countries with low endowments of education in 1960 are permanently condemned to slow growth trajectories. Yet we want to know whether Pakistan and other countries could have bought faster income growth by expanding their educational systems at faster rates than average since 1960. This question is difficult to address because of the likely simultaneity of economic growth and investment in education. After all, high growth rates of income permit a country to buy more education. And there may be factors, not easily captured in a quantitative model, that contribute to both a high rate of growth and high levels of investment in human capital.

To minimise these problems (of simultaneity and of possible spurious correlation), while still allowing for investments in human capital subsequent to 1960, we estimate a pooled cross section version of the Barro model over subdivisions of the 1960–1985 quarter century. We divide Barro's quarter century into three periods: 1960–1970, 1970–1980, and 1980–85. Controlling for other factors, we examine the impact on average annual growth in real per capita GDP between year i and year j of the level of per capita GDP and secondary-school enrollments at the start of the period (year i) and primary school enrollments at the start of the previous period (year k).[19]

[19]Following Barro, we use enrollment rates at the start of the relevant period to eliminate the endogeneity resulting from the responsiveness of investments in education to growth in income. We lag primary-school enrollment rates to reflect the fact that children currently in primary school are unlikely to have a major impact on the economy until the following decade.

Pooling observations[20] over the three periods yields the following regression:[21]

$$GR_{ij} = 0.0334 - 0.0003\ GDP_i + 0.0207\ PRIM_k + 0.0328\ SEC_i \qquad (2)$$
$$(3.40) \qquad (2.80) \qquad (2.85)$$
$$N = 318 \quad R^2 = .32$$
(t-statistics in parentheses)

As before, growth is negatively related to initial level of per capita income and positively related to the human capital proxies. Shifting to shorter time periods dramatically weakens the convergence result. Over a decade or half-decade, the regression results suggest that a $1,000 increase in initial per capita GDP would reduce annual average growth by only 0.03 percent. In contrast, the magnitude of the human capital effects is little changed. For example, all else equal, a 10 percentage point increase in primary-school enrollments in 1970 would have increased average annual growth in real per capita GDP between 1980 and 1985 by 0.21 percentage points; a 10 percentage point increase in secondary-school enrollments would have increased the growth rate by 0.33 percentage points.

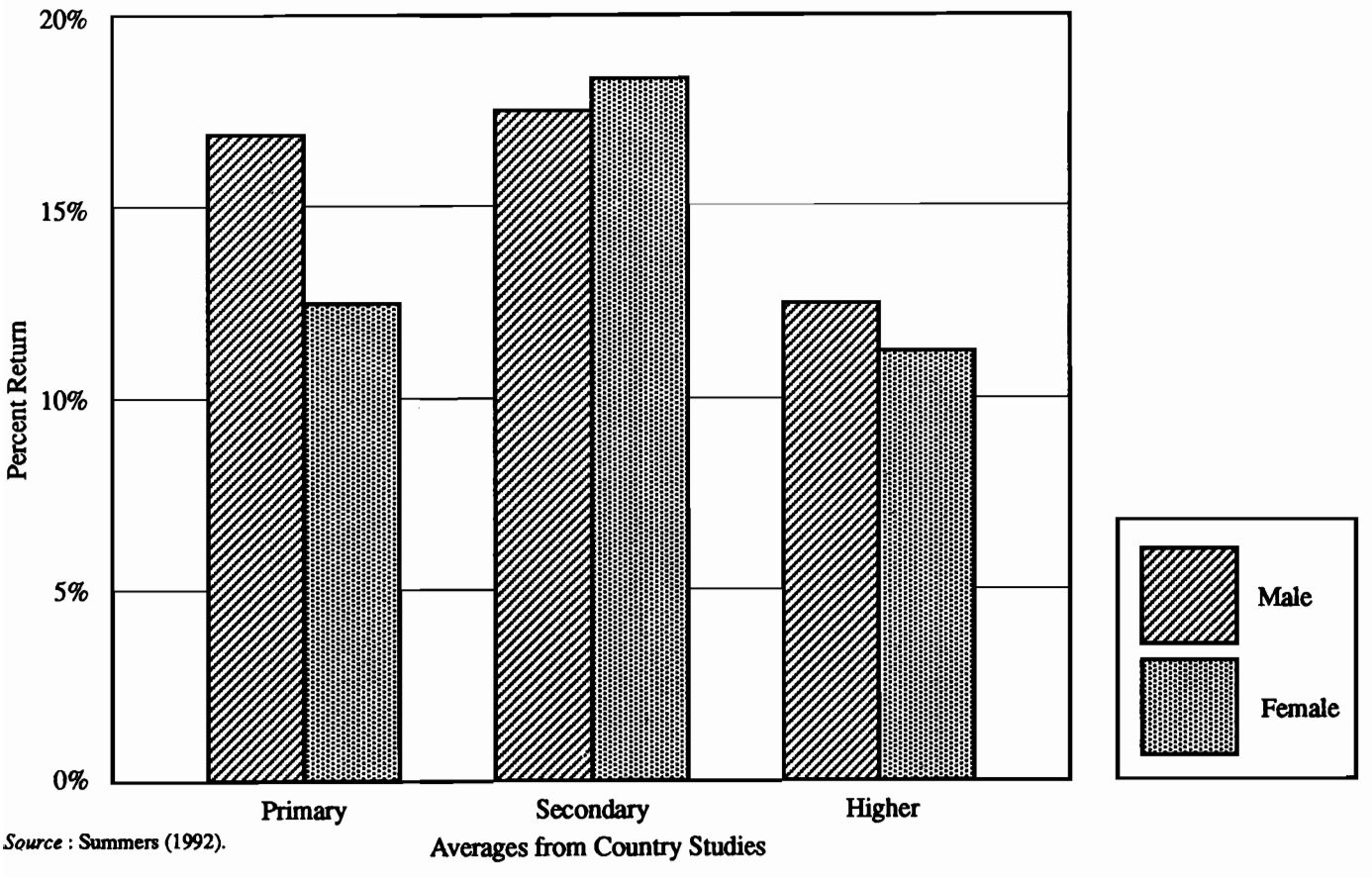
A second shortcoming of Barro's results, especially for Pakistan, is that they do not allow for possible different effects of male versus female enrollments. An important characteristic of Pakistan's education system is the substantial gender gap in primary and secondary enrollments. Are there differences in the contribution to economic growth of female versus male enrollments? For example, does female education matter less because women are less likely to work for wages in the modern sector?

To examine this question, we substitute sex-specific primary-school enrollment rates into the original Barro model.[22] The results, reported in Table A.3, column 2, indicate no significant difference between the coefficient values for

[20]Our sample includes 114 countries. However, data were not available for all countries in all periods. In pooling the data, we include dummy variables to allow for global shocks between periods. The Chow test ($F_{10,300} = 1.61$) rejects the null hypothesis that the coefficients on the explanatory variables vary across periods.

[21]Estimates for all coefficients appear in Equation (3) of Table A.3. The other explanatory variables are average (1970–1985) ratio of real government consumption (exclusive of defense and education) to real GDP; deviation of the 1960 purchasing power parity value for the investment deflator from the sample mean; and dummy variables for 1970–1980 and 1980–1985.

[22]There is substantial multicollinearity affecting the estimators of the primary-school enrollment coefficients in our models. Taken individually, we are unable to distinguish the coefficients on the enrollment variables from zero. However, a joint F-test rejects the null hypothesis that both primary-school enrollment coefficients are zero. The estimated equation differs from Barro's by dropping the revolution and assassination variables and adding nine additional observations. All other coefficients are qualitatively unchanged.



Source : Summers (1992).

Fig. 2. Private Returns to Educating Females are High at all Levels.

and defense; see Table A.4) represented a higher share of GDP in Pakistan than in the other four countries. Pakistan's secondary enrollment ratio was almost twice that in Indonesia but was well below the ratios for Malaysia and Korea. Only 30 percent of school-age children were enrolled in primary school–less than half the ratio for Indonesia and less than one third of the ratios for Korea and Malaysia. Between 1960 and 1985, Pakistan's real per capita GDP grew at an average annual rate of 2.9 percent, while Indonesia, Korea, and Malaysia all experienced more rapid growth.

In our first simulation (Figure 3), we calculate the gain in Pakistan's 1985 per capita GDP that would have resulted had Pakistan's 1960 primary enrollment ratio been the same as, alternatively, Indonesia's, Korea's, or Malaysia's. In 1960, Indonesia's primary enrollment ratio was 37 percentage points (.67 –.30) higher than Pakistan's. From Equation (1) above, a 37 percentage point increase in the primary enrollment ratio results in an increase in the average annual growth rate of 0.92 percentage points (.37 × .025). Thus, the model predicts that had Pakistan's primary enrollment ratio in 1960 been 67 instead of 37, per capita income over the next quarter century would have grown at 3.8 instead of 2.9 percent per year.[28] At this rate, per capita GDP would have reached $1.442 in 1985 instead of the $1,153 level actually attained. Changing Pakistan's 1960 primary enrollment ratio to Malaysia's ratio results in an increase in 1985 per capita income of more than 25 percent. Performing the same simulation using primary enrollment ratios for Malaysia and Korea obviously leads to even greater increases in annual growth rates of 1.65 and 1.60 percentage points, resulting in per capita income 49.0 percent and 47.0 percent, respectively, above the level attained in 1985. Figure 3A illustrates the simulated growth paths.

In the simulation presented in Figure 4, we equate 1960 secondary as well as primary enrollment rates in Pakistan with those in Indonesia, Korea, and Malaysia. Using Malaysia as the counterfactual raises the secondary enrollment ratio by 8 percentage points (.19 –.11). Multiplying this by the coefficient on secondary enrollments from Equation 1 yields a gain in the average annual growth rate of an additional quarter of a percentage point (.08 × .0305 = .00244). Combining this with the gain from equating the primary enrollment rates in Malaysia (as in the first set of simulations) results in an increase in the average annual growth of per capita GDP of 1.89 percentage points and 1985 per capita GDP 57.7 percent greater than

[28]In fact, the Barro model predicts a lower annual growth rate for Pakistan than Pakistan's actual growth rate. For example, for the 1960–70 period, the model predicts growth of 2.8 percent, while actual growth was 3.6 percent. Pakistan thus appears to have been a relatively efficient economy in its use of human capital (and physical capital), given its initial 1960 income level. This reinforces our view that Pakistan could have exploited additional amounts of human capital over the period–in contrast, for example, to Sri Lanka.

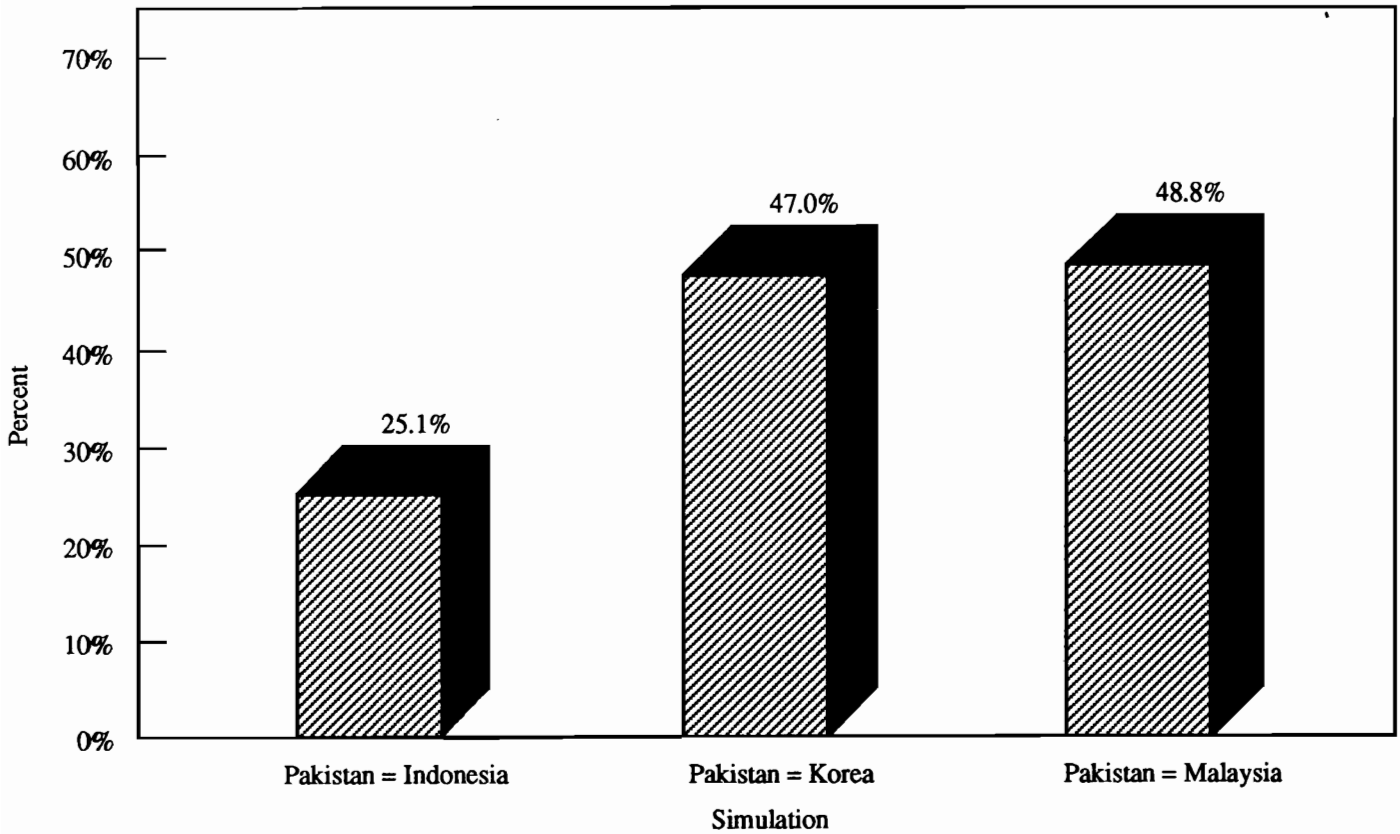


Fig. 3. Gain in 1985 per Capita GDP
Changing 1960 Primary Ratio.

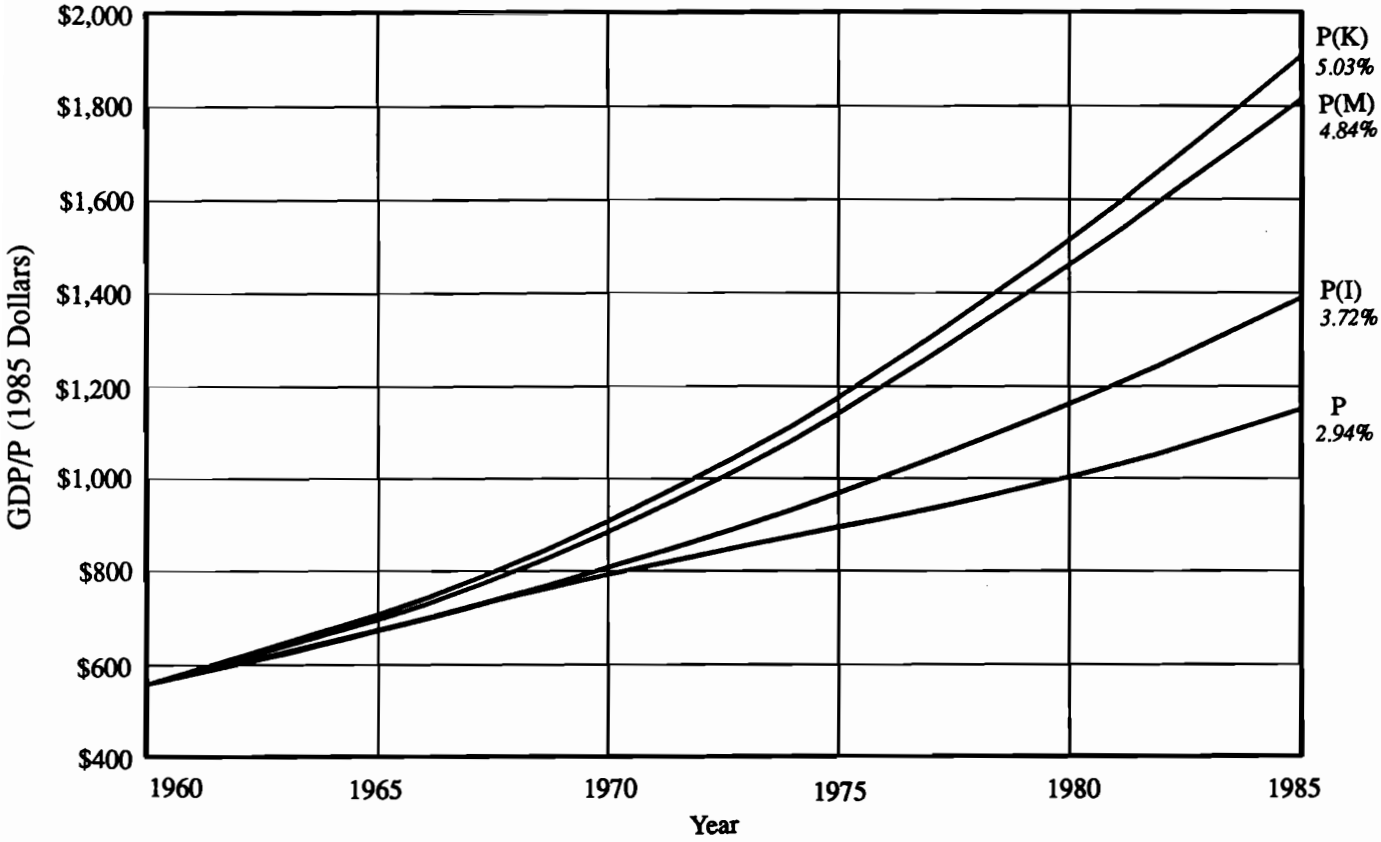


Fig. 3A. Simulated per Capita GDP Growth Paths 1960–1985.

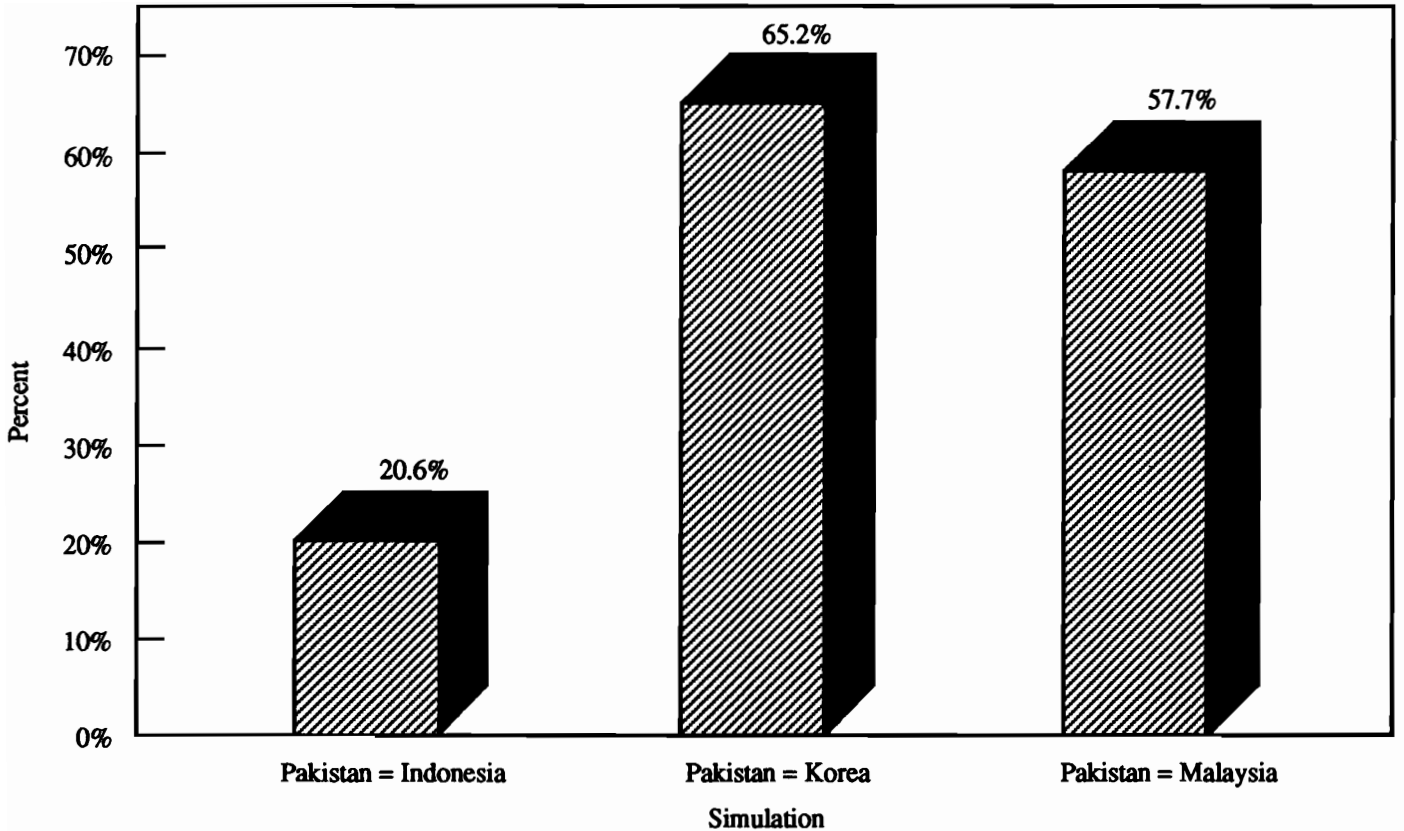


Fig. 4. Gain in 1985 per Capita GDP
Changing 1960 Primary and Secondary Ratios.

Pakistan attained. The gain from the Korean simulation is even greater, 65.2 percent.[29]

These dramatic gains in 1985 income are gains foregone–the cost of Pakistan's failure to produce a stock of human capital comparable to that found in East Asian countries in 1960. The magnitude of the costs illustrates the power of compound growth over a 25 year period. The relatively modest impact of one generation on an economy's growth path can impose huge costs or benefits on subsequent generations.

Must the next generation accept the growth path imposed on it? Must nations wait 25 years to capture the benefits of investments in human capital? In our next simulations, we examine how changes in Pakistani policies toward education since 1960 might have expanded growth in per capita income between 1980 and 1985. Figure 5 provides an answer to the following question: What would have been the impact on growth had Pakistan managed to expand 1970 primary school enrollments and 1980 secondary school enrollments to the rates achieved by Indonesia, Korea and Malaysia?

In 1970 (see Table 1), Malaysia's primary enrollment ratio (.91) was 47 percentage points higher than Pakistan's (.44), and its 1980 secondary enrollment ratio was 34 percentage points greater. From our pooled cross section (Equation 2 above), the combined effect of these increases on annual growth in per capita real GDP between 1980 and 1985 would have been 2.09 percentage points.[30] By 1985 this would have resulted in per capita GDP of $1,275, 10.5 percent greater than the $1,153 attained. The Korean simulation yields a gain of 17.0 percent, while equating enrollment rates to the Indonesian level results in a gain of 5.6 percent. Figure 5A illustrates the simulated growth paths.

Of course, resources are limited so that it may be difficult to expand both primary and secondary systems. Figure 6 presents the results of simulations in which Pakistan matched only the 1970 primary enrollment rates of East Asian countries, while holding secondary enrollment rates at the actual 1980 levels. Such an expansion of the educational system would have generated sufficient growth to raise 1985 living standards 6.3 percent above actual levels ($1,225 vs $1.153) under the Korean simulation and 4.8 and 3.1 percent under the Malaysian and Indonesian simulations, respectively.

After only five years, the cost of foregone growth in income easily exceeds conventional estimates of the costs of allocative inefficiencies associated with market failures, price controls, and the like. The simulations presented in Figures 5

[29]Because Indonesia's 1960 secondary enrollment rate (.06) was below Pakistan's (.11), equating primary and secondary enrollment rates results in lower per capita GDP in 1985 (a 20.6 percent gain) than equating primary alone (a 25.1 percent gain).

[30]0.0209 = .47×.0207 + .34×.0328.

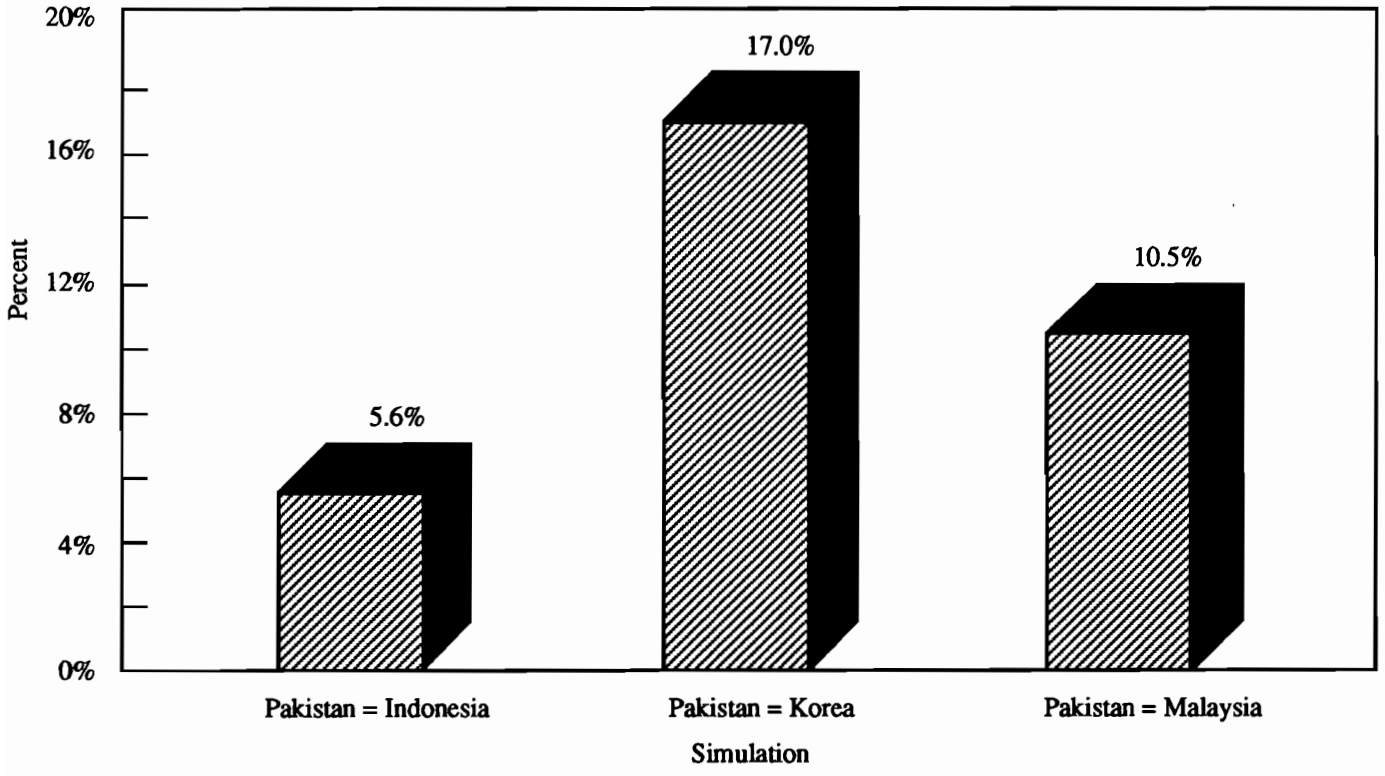


Fig. 5. Gain in 1985 per Capita GDP
Changing 1970 Primary and 1980 Secondary Ratios.

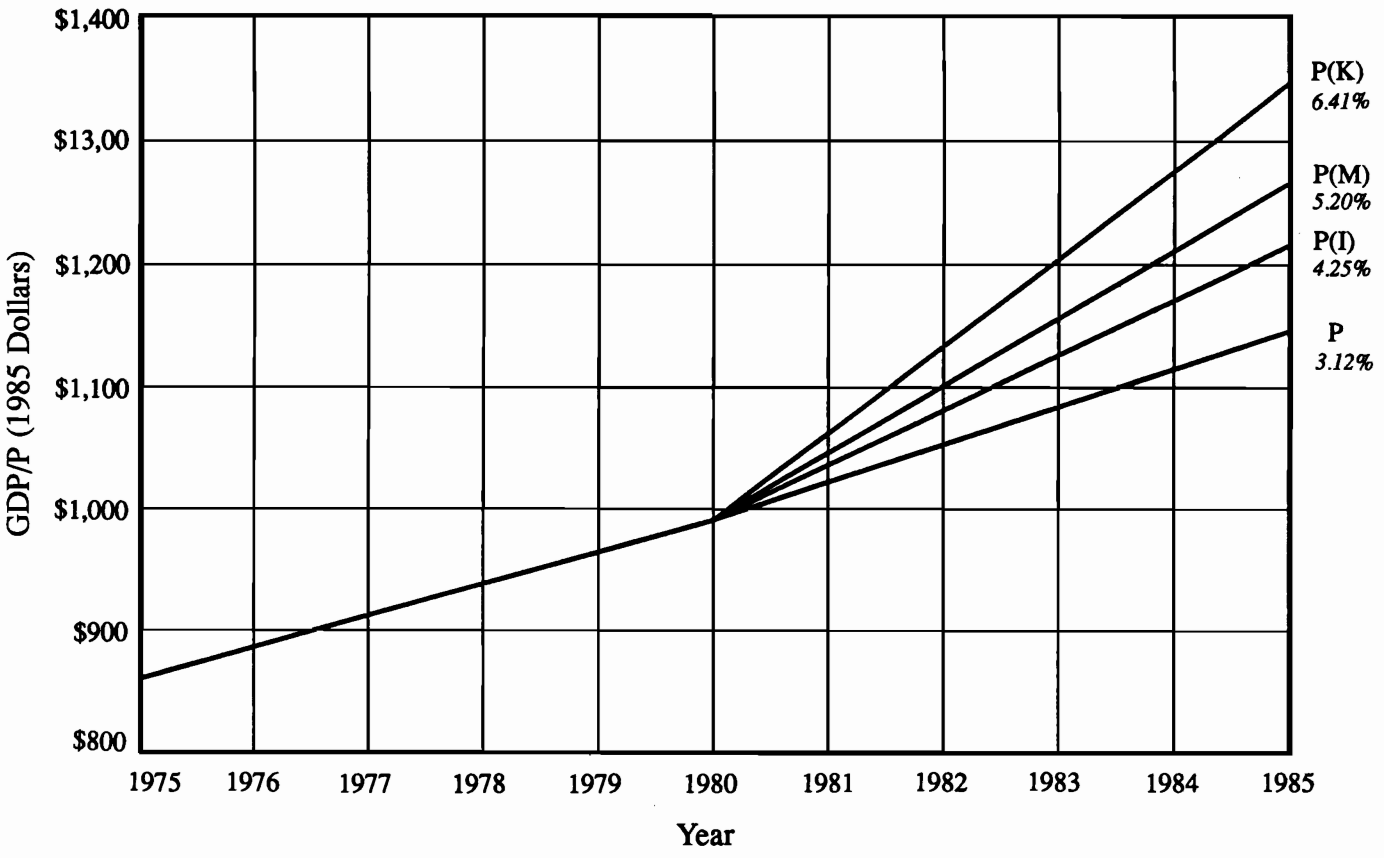


Fig. 5A. Simulated per Capita GDP Growth Paths 1980–1985.

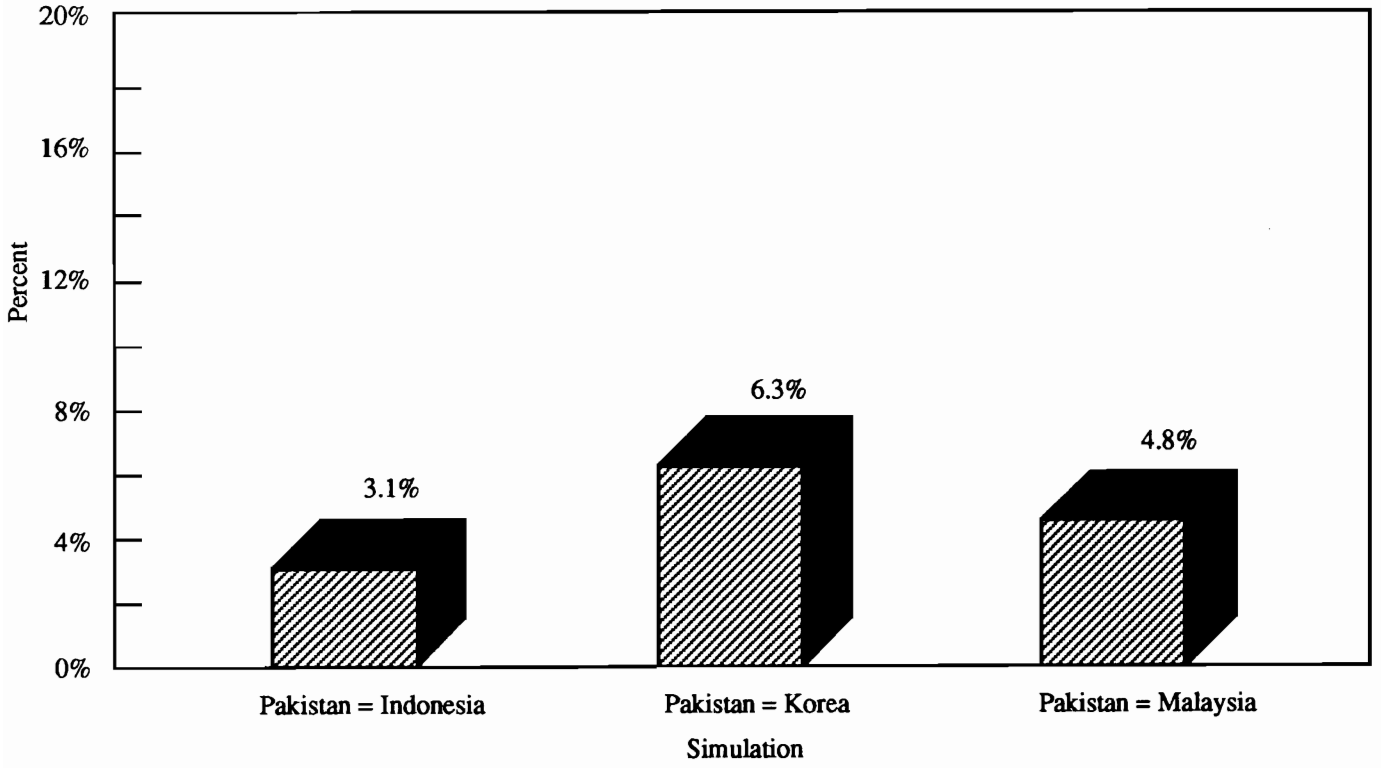


Fig. 6. Gain in 1985 per Capita GDP
Changing 1970 Primary Ratio.

and 6 can also be interpreted as suggesting the benefits to Pakistan in the near future of increasing investment in human capital to East Asian levels.

V. THE COSTS TO PAKISTAN OF LOW FEMALE ENROLLMENTS

Much of the difference between Pakistan and East Asia in aggregate enrollments is due to the much larger gender gaps in enrollments in Pakistan. In 1960 Pakistan's female primary enrollment ratio was 32 percent of the male rate and among the ten lowest in the world. While the ratio of female to male enrollments increased markedly from 1965 to 1985, at 47 percent it remained among the world's ten lowest.[31]

Given the fiscal constraints Pakistan currently faces, substantial increases in capital outlays and recurrent expenditures would seem necessary to bring, within a short period of time, aggregate enrollments up to the levels that prevail in East Asia. Even assuming the financial resources exist, implementation would not be easy, since it would require both new investments and extensive restructuring of recurrent budgets to sustain higher recurrent spending at the provincial and in some cases, municipal levels. At the local level, however, rapid increases in female enrollment could be an attractive alternative and would of course lead to increases in aggregate enrollment (by more than 10 percentage points).[32] Increasing educational opportunities for girls need not require large new capital investments nor even dramatic changes in local organisation. For example, opening existing boy's schools to girls, either with co-education or with different shifts, could quickly reduce the gap in enrollment at much lower cost than building new schools for girls.[33]

Increasing the supply of school places for girls would have little impact on their enrollment rates if parents are on average less willing to send girls than boys to school. A gap in demand for schooling by sex could arise from a gap in expected returns due, for example, to wage discrimination in labour markets or strong attachments to traditional roles that effectively limit female access to high productivity sectors or occupations.

However, recent evidence suggests that parents are increasingly willing to send girls to school, especially at the primary level. First, Alderman *et al.* (1992)

[31]See Alderman, Behrman, Ross and Sabot (1992).

[32]Applying ratios of male to female enrollment from Table 2 to overall enrollment shown in Table 1.

[33]At the same time, much more emphasis in new capital outlays could go to building and staffing girls' schools, which could also be co-educational (though staffed and administered by women). This is the approach being considered in Balochistan under a new project proposed for World Bank financing.

conclude that, contrary to conventional wisdom, the gaps in enrollments in primary and middle schools in rural areas are due largely to differences in school supply. Table 5 indicates that in villages with a girl's as well as a boy's school, the enrollment rate for girls is roughly the same as that for boys. In villages with a girl's school nearby, rather than in the village, the enrollment rate of girls is still ninety percent of the boy's rate. Second, in a recent survey in the approximately 9,000 rural villages of Balochistan, the poorest province of Pakistan, leaders (all men) in more than half the villages indicated they had no objection to girls attending school with boys; moreover, already in Balochistan, one-third of all girls in primary school attend "boy's" schools.

Table 5

Proportion of Respondents Attending School

	Boy's School and Girl's School in Village		Boy's School and Girl's School Nearby	
Age Cohort	Male	Female	Male	Female
10–14	93.1	97.8	71.8	66.1
20–24	100.0*	–**	67.2	43.2
30–44	43.8	–***	52.2	32.3

Source: Prepared from "The Gender Gap in Cognitive Skills in Poor Rural Economy" by Herold Alderman, Jere R. Behrman, David R. Ross, and Richard Sabot, and presented in "Investing in *All* the People" by Lawrence H. Summers.

* 12 respondents.

** All 7 respondents attended school.

*** Both respondents attended school.

Pakistan is moving toward the point at which, if a school is available, parents are as likely to send their daughters as to send their sons. Increasing the supply of educational opportunities for girls thus has tremendous potential for rapidly increasing enrollments.

By how much might the rate of growth of Pakistan be augmented by eliminating the gender gap in schooling? Figure 7 presents four simulations designed to capture the costs to Pakistan in foregone growth of failing to close the gender gap in human capital accumulation. The first column is based on equating primary and secondary enrollment ratios for girls in 1960 to the (relatively low, by East Asian standards) enrollment ratios for boys. This simulation raises primary enrollments from 30 to 44 percent and secondary enrollments from 11 to 18 percent of the school age population. Applying these changes to the coefficients in Equation (1)

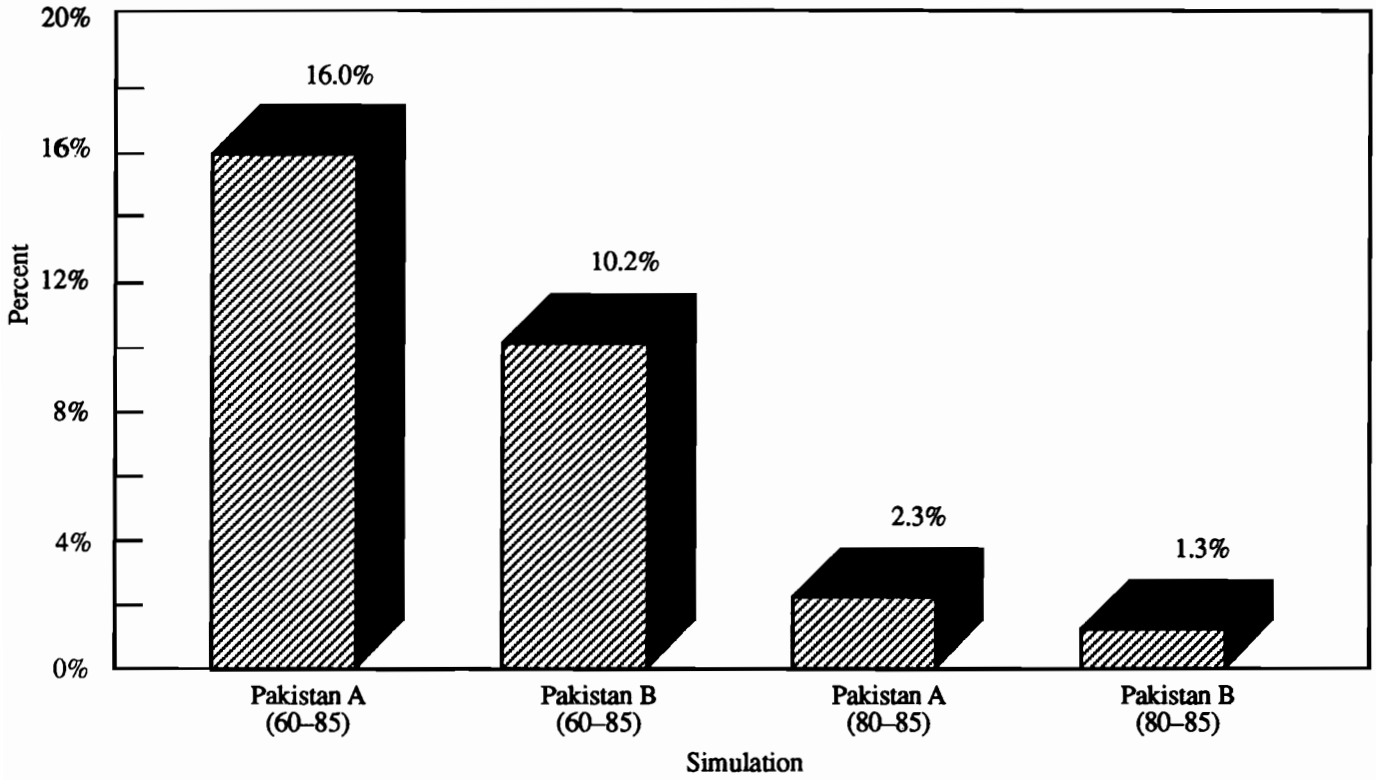


Fig. 7. Gain in 1985 per Capita GDP
Eliminating Enrollment Gender Gaps.

ated with women's education. In East Asian economies, education is also associated with improvements over time in the equality of income across households. These other benefits–social and distributional–are as central a part of the development process as income gains. We conclude that overall development gains foregone for Pakistan have been even greater than our income results alone imply. These results apply to analysis of the past. We believe the implication for the future is clear.

Table A1

Definitions of Variables in Tables A2 and A3

GR6085:	Growth of real per capita GDP (1980 base year) 1960–1985.
GROWTH:	Growth of real per capita GDP (1980 base year), either from years 1960–1970, 1970–1980, or 1980–1985.
GDP60:	1960 value of real per capita GDP in $US thousands (1980 base year).
GDPXX:	19XX value of real per capita GDP in $US thousands (1980 base year).
SEC60:	Secondary school enrollment rate, 1960.
SEC:	Secondary school enrollment rate (used in GDP growth regressions: Corresponds to initial year in Growth variable; i.e. if dependent variable is Growth between 1970 and 1980, then SEC is secondary school enrollment in 1970).
PRIM60:	Primary school enrollment rate, 1960.
PRIMF60:	Primary school enrollment rate for females, 1960.
PRIMM60:	Primary school enrollment rate for males, 1960.
PRIMLAG:	10 year lagged primary school enrollment rate (used in GDP growth regressions: if dependent variable is growth between 1970 and 1980, then PRIMLAG is primary school enrollment in 1960).
GOV:	Average from 1970 to 1985 of the ratio of real government consumption (exclusive of defense and education) to real GDP.
REVOL:	Number of revolutions and coups per year (1960–1985 or subsample).
ASSASS:	Number of assassinations per million population per year (1960–1985 or subsample).
PPI60DEV:	Magnitude of the deviation of the 1960 PPP value for the investment deflator (US = 1.0) from the sample mean.
DUM7080:	Dummy variable used in pooled growth regression: If growth from 1970–1980 period, takes on value of 1. Else, value = 0.
DUM8085:	Dummy variable used in pooled growth regression: If growth from 1980–1985 period, takes on value of 1. Else, value = 0.

Table A2

Variable Means and Standard Deviations

Dependent Variable	(1) GR6085	(2) GR6085	(3) GROWTH
No. of Obs.	98	108	318
GDP60	1.92 *(1.81)*	1.2306 *(1.6669)*	
GDPXX			2.6020 *(2.6486)*
SEC60	0.23 *(0.21)*	0.1951 *(0.2014)*	
SEC			0.3287 *(0.2733)*
PRIM60	0.78 *(0.31)*		
PRIMF60		0.6337 *(0.3832)*	
PRIMM60		0.7779 *(0.3141)*	
PRIMLAG			0.6574 *(0.3526)*
GOV	0.107 *(0.053)*	0.1774 *(0.0647)*	0.1780 *(0.0632)*
REVOL	0.18 *(0.23)*		
ASSASS	0.03 *(0.086)*		
PPI60DEV	0.23 *(0.25)*	–0.0007 *(0.3308)*	–0.0026 *(0.3146)*
DUM7080			0.3585 *(0.4803)*
DUM8085			0.3365 *(0.4732)*
R^2	?	?	?

Table A4

Country Data: Variables Used in Basic Barro Regression

Variable	Country			
	Pakistan	Indonesia	Malaysia	Korea
Real GDP per capita, 1960 (1980 base year)	$558	$493	$1,103	$690
Primary enrollment rate, 1960	30	67	96	94
Secondary enrollment rate, 1960	11	6	19	27
Government consumption/GDP (1970–1985 average)	0.1651	0.115	0.1541	0.1584
No. of assassinations per million population per year (available years, 1960–1985)	0.31	0.12	0.04	0.12
No. of revolutions and coups per year (available years, 1960–1985)	0.23	0.23	0.04	0.31
Absolute value of the deviation of 1960 purchasing power parity value for the investment deflator (US = 1.0) from the sample mean (used as a measure of price distortion)	–0.244	–0.494	–0.281	–.0223

Source: [Barro (1991).]

REFERENCES

Alderman, Harold, Jere Behrman, David Ross and Richard Sabot (1992) The Gender Gap in Cognitive Skills in a Poor Rural Economy. Williamstown, MA: Williams College. (Mimeographed.)

Barro, Robert J. (1991) Economic Growth in a Cross-Section of Countries. *Quarterly Journal of Economics* 106: May 407–43.

Becker, Gary S. (1964) *Human Capital. A Theoretical and Empirical Analysis.* Princeton, NJ: Princeton University Press.

Becker, Gary S., Kevin M. Murphy, and Robert Tamura (1990) Human Capital, Fertility, and Economic Growth. *Journal of Political Economy* 98 :S12–S37.

Behrman, Jere (1991) Investing in Female Education for Development: Women in Development Strategy for the 1990s in Asia and the Near East. Williamstown, MA: Williams College. (Mimeographed.)

Behrman, Jere R., and Nancy Birdsall (1983) Quality of Schooling: Quantity Alone is Misleading. *American Economic Review* 73: December 928–946.

Behrman, Jere R., David Ross and Richard Sabot (1992) Improving the Quality Versus Increasing the Quantity of Schooling for Women in Rural Pakistan. Presented at the 14th Annual Conference on Economic Issues, Middlebury College, 3–4 April.

Behrman, Jere R., and Ryan Schneider (1991) How Do Pakistani Schooling Investments Compare with those of Other Developing Countries? Williamstown, MA: Williams College. (Mimeographed.)

Behrman, Jere R., and Ryan Schneider (1992) An International Perspective on Schooling Investments in the Last Quarter Century in Some Fast-Growing Eastern and Southeastern Countries. Washington, D.C.: World Bank. (Mimeographed.)

Birdsall, Nancy, and Richard H. Sabot (1992) Human Capital Accumulation, Growth and Inequality in Thailand: The Exception that Proves the Rule. Washington, D.C.: World Bank. (Mimeographed.)

Birdsall, Nancy, and Richard H. Sabot (1993) Virtuous Circles: Human Capital Accumulation and Utilization in East Asia. Washington, D.C.: World Bank. (Mimeographed.)

Boissiere, Maurice, J. B. Knight and R. H. Sabot (1985) Earnings, Schooling, Ability and Cognitive Skills. *American Economic Review* 75: December 1016–30.

Chenery, Hollis, and Moises Syrquin (1975) *Patterns of Development, 1950–1970.* New York: Oxford University Press.

Clark, Colin (1940) *The Conditions of Economic Progress.* London: McMillan Press.

Glewwe, Paul (1990) Schooling, Skills and the Returns to Education: An Econometric Exploration Using Data from Ghana. Washington, D.C.: World Bank. (Mimeographed.)

Jamison, D., and L. Lau (1982) *Farmer Education and Farmer Efficiency.* Baltimore, MD: Johns Hopkins University Press.

Kuznets, Simon (1966) *Modern Economic Growth.* New Haven, CT: Yale University Press.

Lucas, Robert E., Jr. (1988) On the Mechanics of Development Planning. *Journal of Monetary Economics* 32: 3–42.

Nelson, Richard, and Edmund Phelps (1966) Investment in Humans, Technological Diffusion, and Economic Growth. *American Economic Review Proceedings* 56: 69–75.

Psacharopoulos, George (1981) Returns to Education: An Updated International Comparison. *Comparative Education* 17:3 583–604.

Romer, Paul (1990) Endogenous Technological Change. *Journal of Political Economy* 98: S71–S102.

Sathar, Zeba A. (1992) Micro-Consequences of High Fertility: The Case of Child Schooling in Rural Pakistan. Paper presented at the Population Council Seminar, Fertility, Family Size and Structure: Consequences for Families and Children. New York, 9-10 June.

Sathar, Zeba, Nigel Crook, Christine Callum and Shahnaz Kazi (1988) Women's Status and Fertility Change in Pakistan. *Population and Development Review* 14:23 415–432.

Schultz, T. Paul (1991) Returns to Women's Education. In E. M. King and M. A. Hill (ed) *Women's Education in Developing Countries.* Washington, D.C.: World Bank.

Schultz, T. W. (1961) Investment in Human Capital. *American Economic Review* 51:1 1–17.

Summers, Lawrence H. (1992) Investing in *All* the People. *The Pakistan Development Review* 31:4 367–404.

Tan, Jee-Peng, and Alain Mingat (1992) *Education in Asia: A Comparative Study of Cost and Financing.* Washington, D.C.: World Bank.

Comments on "Underinvestment in Education: How Much Growth has Pakistan Foregone?"

If it were a discussant's task to highlight weaknesses and lack of clear message of a paper and to report on them–I shall have to be blamed for having failed on this score. I found the paper by Nancy Birdsall and her colleagues most stimulating and clear in message: Pakistan could have had a much higher per capita income, and most likely lower infant mortality, lower fertility and a more equitable income distribution, had it enrolled more children, particularly more girls, in primary and secondary schools since the 1960s.

It is not only our colleagues in the educational sciences who will be pleased to note this recognition of their discipline as so decisive for socio-economic development. We all, I think, have no difficulties in believing that the hypothesis concerning the high economic returns to investment in education is true. There has been too much evidence and theoretical foundation to it. The authors themselves make numerous references to the literature on human capital and its relevance for economic growth. The recent Nobel Prize for Prof. G. Becker was certainly the most prestigious recognition of the validity of the underlying theory. It is against this background of overall appreciation for the paper that I submit a few reflections on some specific aspects of the arguments presented.

The authors speak of a *virtuous circle* of increasing demand for skilled labour and increasing returns to skills in the labour market. Why then, one might ask, has a country like Pakistan not concentrated much more effort and capital on education? Unfortunately, the paper addresses the reasons only marginally. I also cannot explore them in detail here. Generally speaking, politicians may either have been ignorant, or they had other preferences in mind, when they made their decisions on public expenditure and investment. We are all aware that unfortunately short-term objectives, including those which add to prestige and political power, rather than the pursuit of farsighted strategies of poverty alleviation through human capital formation, guide those decisions all too often.

But, to be fair, could it not also be that the politicians are aware that the mechanisms through which higher school enrollment is translated into economic growth are much more complex and diverse between countries than the Barro model or its revised version used by the authors lead us to suggest? The authors themselves acknowledge that human capital accumulation is a necessary, but not a sufficient, condition for higher economic growth. They mention labour demand and

an efficient labour market as further conditions. I fully agree. I would suggest however that the authors give some more empirical evidence that these sufficient conditions were in fact fulfilled in Pakistan so that merely sending more children to school would have led to more production and income, of course with a delay.

But even if it can be demonstrated that more schooling is correlated with higher economic growth a few years later, the causality may not be direct, e.g. it could be that the "open-mindedness", equity concern and other factors which make large schooling possible are better explanatory factors for growth than schooling itself.

Moreover, I also remind us of the other decisive factors which cause differences in economic activity and growth in space and time, i.e. the rate of investment per capita; the financing of this investment out of domestic savings or borrowing; the structure (by sectors) of investment, and the natural resource endowment. I recall in particular the work of Chenery and his colleagues in the 1970s, which may still be a useful source when making the model more sophisticated. The current version of the model does not account for such complexity. Instead, the growth rate of GDP per capita is only related to the initial GDP in a base period and the enrollment rate. Of course, one should not complicate a model if a "simple" one has already a sufficiently high explanatory power. But the version used, while certainly very appealing, admittedly explains only 32 percent of the variance.

With regard to the cross-country regression used as a basis for the analysis, the curves relating primary enrollment rates to GDP per capita (Figure 1A) show Pakistan somewhat below the "norm" of the relationship captured by the regression line. This peculiarity is not sufficiently explained in the paper. Could this not be an indication of the existence of specific factors besides schooling?

I find *another* interesting aspect in the paper. This concerns the so-called "gender gap". The authors found from their model that increasing the enrollment of girls could be as growth-stimulating as increasing the enrollment of boys, in spite of the much lower labour market participation of women. This is a most striking conclusion which might very well serve to overrule an all too common excuse for the neglect of girls in the educational system of many societies. Yet the following questions tend to necessitate further clarification. Opening schools for millions of girls would require massive investment in school buildings, infrastructure and a considerable increase in the number of teachers. Such investment would have had opportunity cost. Would other investment have been reduced? If so, at which cost? These questions are only implicitly discussed.

The authors argue that women who work as mothers and educators of their children at home produce economic goods, just as men do in the production and formal servicing sectors. The underlying argument is not only that the care provided by the mother produces a human capital imbedded in the child, but that this is even

measurable in the economic performance of the child when he/she enters the labour force later on. This is immediately convincing. But is it derived from empirical evidence? The coefficients of the sex-specific enrollment rates seem to be much less statistically significant than the ones of the joint enrollment rates. I suggest some further testing of this hypothesis.

A central difficulty derives from the fact that the female enrollment rate would have to have a generation-long *time lag* in its effect on economic growth because it would only become effective through the children of today's girls. Of course, this was not measurable in the analysis. But, hopefully, longer time series would make such tests possible one day. In this context it might be of interest to conduct more empirical studies on the various forms of care given to children at family and/or community level and their respective impact on those children's professional performance.

In conclusion, I found the paper extremely stimulating and most thought-provoking. I would hope that it not only contributes to a greater awareness of the focal role of education for economic growth, but above all to practical consequences in the form of higher investment in human capital, in particular for school-age children.

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Comments on "Underinvestment in Education: How Much Growth has Pakistan Foregone?"

I am delighted to be a discussant on Nancy Birdsall's paper on "Underinvestment in Education: How Much Growth has Pakistan Foregone?" It is gratifying, in fact it is a windfall gain that both Lawrence Summers in his Quaid-i-Azam Lecture last year and Nancy Birdsall in her Distinguished Lecture this year have chosen to single out education (and female education in particular) as the most critical policy lever for additional economic growth and for development in Pakistan. Many of us, mostly those who have been working on the social sectors in Pakistan, are delighted that economists as renowned as Drs Summers and Birdsall have given their stamp of approval to the urgent need for increased emphasis and expenditure on education and have condemned the pitiful neglect of the education sector in the last three decades.

While I totally enjoyed reading the paper and agree whole-heartedly with its policy conclusions that we must do all to promote education in Pakistan, my reservations about it are based merely on the comparative findings utilised by the authors to reach their main conclusion i.e. that had Pakistan invested more in education in 1960 we would have had much higher economic growth rates today.

The thrust of the paper is based on the paper by Barro published in the *Quarterly Journal of Economics* where he applied a model of economic growth using as his main explanatory variables the GDP and school enrollment rates in 1960–the main conclusion is that human capital does indeed positively influence growth for the period 1960–80. But he himself has mentioned many apprehensions about his model like qualifications about the use of enrollment rates in the 60s as a measure of human capital stock rather than flow of investment over time (presumably before 1960), about the large unexplained differences in the relationship observed over the continents especially Latin America and Africa and issues of quality of education being imparted in individual countries.

But every model I am sure has its limitations. However, I cannot fully appreciate the comparison of Pakistan with three NICs Malaysia, Korea and Indonesia. These Pacific Rim countries have fared unusually will in terms of the Barro model and by all indicators relative to other regions. Their success of the last few decades has been attributed to a variety of reasons; reasons quite apart from their better educational endowment in the 1960s. Political stability, higher investment (especially foreign investment), carefully controlled exchange rates, demand for a highly

skilled and disciplined labour force, are just some differences that come to mind, not to mention totally different cultural milieus to that of Pakistan.

A more relevant comparison, in my opinion, would have been between Pakistan and other South Asian countries which Dr Birdsall made in her presentation but not in her paper. Here the thesis presented in the paper runs into problems. Taking the case of Sri Lanka and Pakistan with its much higher enrollment rates in the 60s, but Pakistan has fared comparably if not better in terms of economic growth. In comparison to India too, Pakistan's investment in human resources is lower but growth is higher. If anything, Pakistan is a case in hand which turns the argument presented in the paper upside down: the question we ought to be posing is perhaps how did Pakistan manage to achieve higher growth than its neighbours despite such low education outlays? Dr Birdsall suggested some answers to this question in her presentation.

But the difference may lie in a time perspective: whereas Dr Birdsall has focussed on the advantages of education for economic growth in a short period, I would like to argue that Pakistan, has in fact, bought higher growth in the short run at the expense of development outcomes including growth, political stability and well-being in the longer run. The real damage in my opinion is the detrimental effect of the shortsighted low emphasis on education on "other benefits" as they are termed in the paper but which are not focussed on much. These are the demographic features, particularly fertility and also infant child mortality. While Pakistan's economic growth record looks almost impressive in comparison to south Asia, its demographic record looks exceptionally bleak. (Nancy Birdsall herself stated some comparative figures for South Asia in her commentary yesterday.) I would just like to add that apart from the international evidence there is well-researched and documented evidence *WITHIN* Pakistan of the strong negative associations between female education and fertility and child mortality and positive associations with schooling of children especially girls. In fact nothing else seems to make much of a difference in explanations of demographic behaviour in Pakistan. Household income certainly does not have an impact comparable at all to female education.

Dr Birdsall is totally correct in recommending greater expenditure on education due to its positive outcome on growth and "other development benefits". The problem is that this may be easier said than done. The failure to provide universal primary education (in the day and age when even a poor country like Bangladesh has enforced it) is not a mere oversight *nor* an accident. It is an issue deeply embedded in the development policies pursued in Pakistan in the last few decades (actually back in the 50s and 60s). The main thrust of economic policy has been an emphasis on development of infrastructure and on investment in Industry i.e. the development of hardware vs software. I would like to add that this was on the

advice of the Harvard Advisory Group that the emphasis was on achieving growth and the recognition of the importance of the social sectors has dawned on even the donors as late as the last 4-5 years.

The point I am trying to emphasise is that increasing education has never been such a flexible or available policy lever–the politics of education is quite critical to understand in the Pakistan context. In 1947 we inherited a colonial tradition (where the elite was highly educated but the base was very small)–the structure remains essentially unchanged as the base was never deliberately broadened. Urban elites have mainly ensured high quality education for their children in private schools while the feudals in rural areas have strong reasons to hinder the spread of education in their constituencies because of the lessening of their hold on labour and on their tenants. But above all education, as all the social sectors, have been sacrificed at the expense of huge defense budget outlays. Whenever there is a squeese, expenditure for education was the first to be axed.

But what about private initiatives to supplement public education efforts. After all, as Birdsall points out in her paper, the higher human capital outlays in Malaysia, Korea and Indonesia in the 70s and 80s were also largely spurred by the private sector and were "demand" driven. One problem in Pakistan which actually impinges directly on Birdsall's results is that there has not been, and probably still is not, a demand for a very skilled labour force. Social returns to education are doubtlessly high but there is little that the educated youth are able to do in rural Pakistan.

Finally, though the authors are correct in saying that Pakistan is "moving towards a point at which, if a school is available, parents are as likely to send their daughters as to send their sons"... it is a question of degree. Our research also based on Pakistan differs somewhat from the findings of IFPRI based on studies by Sabot and Alderman and shows quite disparate desires for boys' and girls' schooling amongst the poor in rural Pakistan. Setting up schools in each village will certainly raise female enrollment, having a female teacher resident will improve the situation even more but above all it is parents' perceptions that there are concrete returns to female education (for that matter male education) which will really bump up enrollment rates. At the moment employment opportunities, apart from low paying informal sector jobs in the urban areas and agricultural work which is not remunerated nor recognised, are still very limited. So the gender gap in schooling is unlikely to disappear very simply because the labour market in Pakistan is biased against females and strong adherence to traditional roles (though changing) by and large continues. In addition girls marry out and contribute to husband's family labour, the only benefit of education may be perceived to be better marriage prospects.

The private demand for education can, in fact, fuel change–it has already

begun to do so in urban areas where you can see the burgeoning of schools. In the rural areas where agriculture remains predominant future return to education investment may appear low to parents particularly if they are poor. But the key ultimately lies in the demand for children's schooling–a shift in this demand for schooling is the change required before any major shifts in the demand for children and in fertility occur in Pakistan.

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