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HUMAN RESOURCE DEVELOPMENT AND INTERNATIONAL COMPETITIVENESS IN ASIA

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I. INTRODUCTION

There is a growing concern among observers of recent developments in Southeast Asia that the present economic crisis in a number of countries, such as Thailand, Indonesia, Malaysia and the Philippines, is more than a macroeconomic crisis. It has been argued that the financial crisis in these countries can be attributed, in some part, to their inability to shift their exports to higher value-added goods and services in the face of competition from countries such as China, Vietnam, and India that have a cost advantage in unskilled labor. In particular, China has become a formidable player in low-skill manufacturing with its huge supply of unskilled labor and with its enormous expansion of manufacturing capacity in this sector during the last decade. The argument is that countries such as Thailand, Malaysia, Indonesia and the Philippines have been unable to move into higher value-added and higher-skill exports because of a weak human resource base (in particular, a short supply of secondary- and tertiary-trained workers).

The objective of this paper is to provide an overview of the human resource situation – in particular, education, training, health and nutrition – in developing member countries (DMCs), and relate it to the issues of competitiveness confronting these countries. The first part of the paper is devoted to a discussion of the state of human resources in Asia, while the second part considers the issue of competitiveness and relates it to human resource development. Possible policy priorities and strategies are discussed in the final section of the paper.

II. EDUCATION

A. Adult Literacy

There has been an enormous expansion in education at all levels among DMCs, resulting in a general increase in literacy rates throughout Asia. Table 1 shows adult literacy rates in selected DMCs in 1970 and 1994. While countries such as Korea, Philippines, Thailand and Sri Lanka started out with generally high literacy rates in 1970, most other countries in the region had fewer than two-thirds of the adult population literate. By 1995, these countries had increased their literacy rates by 40-120%. However, despite these large increases, literacy rates in South Asia remain pitifully low, with Nepal having a literacy rate of only 27% and Bangladesh and Pakistan having a literacy rate of 37%. Even in India, nearly one-half of all adults remained illiterate in 1994.

As newly-schooled cohorts of children become adults, the adult literacy rates in most DMCs will continue to rise. However, this rise will necessarily be slow because of the continued presence of large numbers of older, illiterate adults. Literacy programs targeted to this group are vital, as these adults will continue to be

Table 1: Adult literacy rates, 1970 and 1994

Country	Adult literacy rate (%)	
	1970	1994
Korea	88	98
Thailand	79	94
Malaysia	60	83
Sri Lanka	77	90
Philippines	83	94
Indonesia	54	83
Myanmar	71	83
India	34	51
Pakistan	21	37
Bangladesh	24	37

Source: UNDP, 1997

economically active for several decades and their illiteracy will be a drag on economic productivity and competitiveness.

B. Primary Education

1. Levels and Trends

Despite large increases in the school-aged population of most DMCs (with the exception of China, Hongkong and Singapore) during the last three decades, school enrollment rates have improved impressively in every DMC, indicating that schooling enrollments have expanded more rapidly than the population of school-aged children (Table 2). For instance, the gross primary enrollment rate increased nearly 11-fold in Nepal between 1960 and 1992, while it more than doubled in India. In general, countries that had lowest primary enrollment rates in 1960 experienced the largest increases in the enrollment rate. As a result, the gap in expected years of primary schooling between the low and high income DMCs has narrowed substantially during the last three decades. Indeed, other than in Afghanistan and Bangladesh, there is virtually universal enrollment of children aged 6-12 years in school in much of Asia.

Table 2: Primary enrollment rate, 1960 & 1992

Country	Gross enrollment rate (%)		Net enrollment rate (%)
	1960	1992	1992
South Asia			
India	41	101	
Bangladesh	47	79	70
Myanmar	56	105	
Nepal	10	109	
Pakistan	30	44	
Sri Lanka	95	105	
Southeast Asia			
Indonesia	67	114	97
Malaysia	96	93	
Philippines	95	112	99
Thailand	83	99	
East Asia			
Hongkong	91	102	
Singapore	112	107	
Korea	94	103	100
China	109	120	96
Transitional Economies			
Afghanistan	9	31	29
Cambodia	64	109	62
Lao PDR	25	104	64
Mongolia	79	97	
Viet Nam	.	101	78

However, in virtually all the countries for which data are available (with the exception of Korea), the net enrollment rates at the primary level are significantly lower than the gross enrollment rates (Table 2), suggesting that overage enrollment in primary schools is very common in most DMCs. This occurs because of both late entry into school and high levels of grade repetition. Especially in the rural areas of Cambodia, Laos, Vietnam and the South Asian countries, it is not unusual to find children starting school as late as 8 and 9 years of age.

2. Gender and Income Disparities

While, on average, gross enrollment rates for primary-age children are not a problem in most DMCs (with the sole exception of Pakistan), the average enrollment figures mask large differences across economic groups and gender. Boys generally have higher gross rates of primary enrollment than girls, parti-cularly in the South Asian countries. For example, in India, the gross primary enrollment rate is only 89% for girls versus 112% for boys. In Pakistan, the gross primary enrollment

rate is 68% higher for boys than for girls (57% as opposed to 30%). Thus, access to primary schooling opportunities is by no means universal among DMCs. There is a need for substantial expansion of primary schooling opportunities, especially for females in South Asia. Given that the population of primary school-aged children is expected to grow by 1.2-1.6% per annum between 1990 and 2025 in a country like Pakistan, the task of expanding access to primary schooling will not be trivial.

Table 3: Gross primary enrollment rates (%), Indochina, 1992-96

Country	Year	Per capita expenditure quintile					Total
		Poorest	Second	Third	Fourth	Richest	
Laos	1992-93	93	98	112	119	133	110
Vietnam	1993	88	100	105	110	107	101
Cambodia*	1996	93	101	113	115	126	109

Notes: *Data refer to rural quintiles.

Source: World Bank (1994), World Bank (1995) and UNDP (1997a).

There are also large disparities in enrollment across economic groups. Data reported by school facilities unfortunately are unable to indicate the extent of economic disparities. However, evidence from household surveys in some DMCs suggests that there are large differences in enrollment rates across expenditure groups. For instance, in Cambodia and Laos, the gross enrollment rate for the richest 20% of primary-age children is 35-43% greater than that for the poorest 20% (Table 3). The differences in the net enrollment rates are even greater, since poor children typically have delayed entry into primary school and also have higher rates of grade repetition.[1]

School quality and internal efficiency. Even though the overall quantity of primary schooling opportunities in most DMCs may be adequate, there is a real problem with the quality of primary schools. Several factors are responsible for the low quality of schooling, including poorly-paid teachers, very low expenditures on non-salary items (such as teaching and learning materials, including textbooks), inappropriate and overloaded curriculum, and a generally unsupportive learning environment. The low quality of schooling is manifested in the form of low test scores, high levels of grade repetition, and high drop-out rates. In countries such as Nepal, Cambodia and Laos, more than one-quarter of children in primary school repeat a grade (UNESCO, 1995). Behrman and Deolalikar (1991) have estimated that as a result of grade repetition, children in Indonesia spend an average of between 8 and 10 years in primary school (as opposed to the recommended 6 years).

It is possible that repetition in primary schools is deliberately encouraged as a matter of school policy in some DMCs, as there are just not enough spaces in the secondary schools to accommodate

[1]For instance, in Cambodia, average age at entry into primary school is 8.3 years for the poorest rural quintile of children, as compared with 7.5 years for the richest rural quintile (UNDP 1997a).

all primary school-leavers. This might help explain why repetition rates are much lower at the secondary level; secondary schools need to promote students irrespective of their academic performance in order to make space for new arrivals.

Drop-out rates are high as well. The combination of high rates of repetition and drop-out means that there is enormous wastage in educational systems that are strapped for resources in the first place. UNESCO data suggest that of the cohort of children entering primary school in low-income DMCs, such as Bangladesh, Pakistan, Nepal and Laos, only about one-half reach grade 5 or 6 (UNESCO, 1995). Household survey data for 1996 from Cambodia also highlight the problem: of 1,000 pupils that enter primary school, only 277 manage to successfully graduate from primary school (i.e., complete grade 6) (Figure 1). The high drop-out and repetition rates also mean, of course, that many students leave school unable to read or write.

Average pupil/teacher ratios are often considered as a proxy for school quality, as large class sizes inhibit learning. In Asia, average pupil-teacher ratios in primary school vary considerably, ranging from class sizes of 20 or fewer pupils in Thailand and Malaysia and class sizes of 60 or more students in India and Bangladesh. By this criterion, the quality of primary education in India and Bangladesh is considerably worse than would be predicted at their levels of per capita income (Figure 2).

Another problem with the quality of primary education is lack of motivation on the part of primary-school teachers, many of whom (especially in the public school system) are poorly paid. As would be expected, Figure 3 shows a strong relationship between the average salary of primary-school teachers and per capita GDP across a small group of Asian countries in 1990.

How does *total* government current spending on primary education compare across countries? There is a nearly linear relationship between per capita GDP and current government expenditures on education per pupil in primary (Figure 4). However, an inverted-U relationship is observed between per capita GDP and the *ratio* of current public expenditure per pupil on primary education to GDP per capita (Figure 5). Countries such as Bangladesh, Philippines and Malaysia are observed to "underspend" on primary education, while countries such as Thailand, Sri Lanka, China and India are observed to spend more than would be expected at their level of per capita income.

C. Secondary Education

The cross-country variation in enrollment rates is much greater at the secondary level than at the primary level. At the one end, Bangladesh has a gross secondary enrollment for males of less than 30%, while Korea has a rate that is greater than 90% (Figure 6). The variation in rates for females is even greater, since in both Bangladesh and Laos, the gross secondary enrollment rate for women is less than 20% (Figure 7).

In both Figures 6 and 7, it is observed that Thailand has a much lower secondary enrollment rate than would be expected for a country at its level of per capita income. On the other hand, Sri Lanka is an "over-achiever" in the sense that its secondary enrollment rate of 70-80% is more than twice as high as would be expected at its income level.

There have, of course, been rapid increases in secondary enrollments over time. Between 1980 and 1993, countries such as Nepal, Indonesia and Sri Lanka increased their gross secondary enrollment rates for males by 35-40% (Figures 8 and 9). Since the population of secondary school-

age children was increasing, this means that absolute enrollments were growing even faster than 35-40%.

Table 4 lists the gross secondary-school enrollment ratios in 1990 for a larger group of countries. Thailand is again observed to have an extremely low secondary enrollment ratio (of only 33%) – comparable to that of Vietnam, a country which is significantly poorer. Indonesia, as well, had a gross secondary enrollment rate of only 44% – identical to that of India, a country with less than one-half of its per capita income.

Many of the problems that plague primary education in the DMCs are common to the secondary-school sector. These include internal inefficiency (in the form of high repetion and drop out rates), low quality of schooling, poorly-paid teachers, inadequate current expenditures per pupil, and the like.

At times, there might a conflict between the objectives of expanding the quantity and that of improving the quality of secondary education. Figures 10 and 11 suggest that Thailand, which has a relatively low secondary enrollment rate, spends a lot more – both in absolute terms as well as in relation to its per capita GDP -- than Sri Lanka, which has a considerably higher level of secondary enrollment. Indeed, Thailand is observed to have the highest ratio of secondary spending per pupil to GDP per capita in the Asia region. This points to the danger of looking at enrollment rates alone in comparing secondary education across countries. Likewise, Figure 12 shows that the Philippines, which has a much higher secondary enrollment rate than Indonesia, achieves this in part by having a pupil/teacher ratio in secondary school that is more than two times as large as that in Indonesia.

Table 4: Secondary enrollment rate, 1960 & 1992

Country	Gross enrollment rate (%)		Net enrollment rate (%)
	1960	1992	1992
South Asia			
India	23	49	
Bangladesh	8	19	17
Myanmar	10	23	
Nepal	6	35	
Pakistan	11	21	
Sri Lanka	27	74	
Southeast Asia			
Indonesia	6	43	37
Malaysia	19	60	
Philippines	26	77	59
Thailand	8	39	
East Asia			
Hong Kong	24		
Singapore	32	68	
South Korea	27	91	85
Taiwan	37		
China	21	54	
Transitional			
Afghanistan	1	15	
Cambodia	3		
Lao PDR	1	24	15
Viet Nam	51	32	

Source: UNESCO data base

Gender and income disparities are even greater within countries at the secondary level than at the primary level. This is because in most DMCs, parents have to contribute financially to their children's secondary education, even in the public sector. As a result, low-income households are much less likely than high-income households to send their children to secondary school.

Curriculum Diversification and Reform. An important manner in which the quality and efficiency of education in developing countries can be improved is by diversifying the curriculum in secondary schools. A major part of the problem in developing country educational systems is the lack of relevance to rural life of much of what is taught in rural schools. Teaching of basic literacy should be combined with teaching practical skills for rural employment and agricultural production. A diversified curriculum combines academic with some vocational education, thereby offering students a wider choice of future career opportunities than are offered by the typical technical or purely academic curricula. By making the curriculum more relevant to the needs of the labor market, curriculum diversification can not only improve the employment prospects for school-leavers but also reduce wastage and repetition within secondary schools. The Asian Development Bank has supported diversified secondary-school curriculum in many of its education projects in DMCs.

The need for curriculum diversification and reform may be greatest in the rural areas, where the existing curriculum rarely includes the training of technical manpower required to implement agrarian reform and rural development efforts. In many countries, particularly those in South Asia and Indochina, the number of trained personnel in agriculture are far short of projected manpower needs.

A longitudinal tracer evaluation of curriculum diversification in Colombia and Tanzania -- countries where diversification has been in place since the 1970s -- by the World Bank found that, while students in the diversified secondary schools generally performed better (in terms of achievement test scores) in both vocational and academic subjects than students in traditional secondary schools, the gains in average test scores were achieved at the expense of significant additional cost per pupil. The data on employment prospects and earnings of graduates similarly offered no evidence of significant cost-benefit advantages of diversified secondary curriculum over the traditional secondary curriculum (Psacharopoulos and Woodhall 1985, Psacharopoulos and Loxley 1985).

A tracer study for Indonesia that analyzed the performance of secondary school graduates in the labor market also found that academic tracks were a better investment (in terms of having higher rates of return) than vocational programs (Clark 1983). These results do not weaken the case for curriculum diversification and reform. Instead, what is suggested is that any attempt by an educational system to reform its secondary-school curriculum must be preceded by a careful analysis of the potential educational benefits and costs. In countries that are seriously short of trained agricultural workers, curriculum diversification that includes agricultural training and education would obviously have very high returns.

Unfortunately, data on vocational education and agricultural training are not collected and reported consistently in most developing countries. Hence, little is know about the trends in vocational and agricultural education in these countries. Using limited data from UNESCO (presented in UNDP's *Human Development Report 1997*), Figure 13 suggests that higher-income DMCs, with the sole exception of Malaysia, have larger percentages of secondary school-aged children enrolled in technical and vocational education programs. Indeed, these data suggest that countries that inherited a British educational system, such as Malaysia, India, Pakistan and Bangladesh, give lower emphasis to vocational and technical training in their secondary schools than other countries in the region.

D. Tertiary Education

Tertiary-level enrollment ratios are, for the most part, quite small among DMCs. In 1990, the countries of South Asia averaged between 3 and 10% tertiary enrollment ratios, while those in Southeast Asia averaged between 9 and 16% (with the exception of the Philippines which had an enrollment ratio of 29%) (Table 5). Figure 14, which plots the tertiary enrollment ratios against per capita GNP, shows a linear relationship between the two variables. The Philippines emerges as a "positive outlier" in this regression, having a tertiary enrollment ratio that is more than two times greater that would be predicted for its level of per capita income. It is interesting to note that Thailand, which has a lower-than-expected *secondary* enrollment rate, has a tertiary enrollment rate that is just about what would be expected at its level of per capita income.

Figure 15 shows the percentage of students in tertiary institutions who are enrolled in science and applied fields. In China and Korea between 40 and 50% of all tertiary-enrolled students are in such fields.[2] On the other hand, Nepal andThailand have among the lowest rates of science and applied enrollment.

Table 5: Tertiary enrollment, 1960 and 1990

Country	Gross enrollment ratio (%)	
	1960	1990
South Asia		
India	2	8
Bangladesh	1	4
Myanmar	1	10
Nepal	1	6
Pakistan	1	3
Sri Lanka	1	5
Southeast Asia		
Indonesia	1	9
Malaysia	1	7
Philippines	13	29
Thailand	2	16
East Asia		
Hong Kong	4	20
Singapore	6	8
South Korea	5	39
Taiwan		34
China	-	2
Transitional		
Afghanistan	0	2
Cambodia	0	-
Kazakhstan	-	40
Kyrgyz Rep.	-	27
Lao PDR	0	1
Mongolia	8	15

Source: UNESCO data base

E. Technology Development and R&D Activities

In addition to formal education, there are other aspects of human resource development and training that may be important for international competitiveness. Insofar as innovative activities and research and development (R&D) contribute to productivity growth, the stock of scientists and technicians in a country may be important. Figure 16 suggests that Korea is unique among DMCs in having nearly five times as many R&D scientists and technicians per capita as the other countries in the region. After Korea, China and Vietnam have the next largest stock of scientists and technicians per capita, although the absolute numbers involved are quite small (less than 0.5 scientists and technicians per 100,000 population). Thailand and Malaysia have significantly fewer scientists and technicians than would be expected at their level of per capita income.

[2]Laos has a very high ratio as well, but since the tertiary enrollment rate in Laos is negligible, the large percentage of tertiary students in scientific and applied fields does not amount to many students.

Table 6, which shows R&D spending as a percentage of GNP across a cross-section of countries, confirms the data on R&D personnel. Among DMCs, Korea spends more than three times as much on R&D as a percentage of its GNP as India or Pakistan. The Philippines, Thailand and Indonesia are among the lowest relative spenders on R&D in the region.

There are other indicators of human resource development. While books are not indicators of human resources per se, they are intimately connected to the development of human resources. Figure 17 shows that there is a positive relationship between per capita GDP and the number of book titles published per 100,000 population in a country. Again, Korea emerges as the country with the largest number of book titles published in relation to its population. India emerges as a laggard in this area.

There is likewise a strong positive relationship between per capita GDP and the consumption of printing and writing paper (in metric tons) per 1,000 population (Figure 18). China and the Philippines emerge as the countries with a greater consumption of printing and writing paper than would be expected at their level of per capita GDP.

Finally, Figures 19 and 20 show the use of personal computers and the number of internet users per capita. Both of these are recent innovations that have large potential productivity effects. The data, however, indicate that the diffusion of personal computers is still quite limited in Asia. With the exception of Malaysia and Korea, most countries in the region have only between one and two personal computers per 100 persons. The number of internet users is even fewer -- only one-two users per 100,000 population in most countries of the region. Korea has nearly five times as many internet users per capita as the country with the second-highest number of internet users per capita (viz., Malaysia).

Table 6: R&D expenditure as a percentage of GNP, selected countries in Asia

Country	Year	R&D expenditure as % of GNP
China	1993	0.6
India	1990	0.8
Indonesia	1988	0.2
Japan	1991	3.0
Korea	1994	2.8
Malaysia	1992	0.4
Pakistan	1987	0.9
Philippines	1984	0.1
Singapore	1994	1.1
Sri Lanka	1984	0.2
Thailand	1991	0.2

Source: UNESCO database

III. HEALTH AND NUTRITION

A. Outcomes

Life expectancy and infant mortality. There has been a dramatic improvement in health and nutrition conditions in Asia during the past 3-4 decades, although the magnitude of the changes have varied considerably across countries. Table 7 shows the infant mortality rate and average life expectancy at birth for selected DMCs in 1960 and 1994. At one end are countries such as Korea, Hongkong, Singapore, Sri Lanka, Thailand and Malaysia, which reduced infant mortality rates between 1960 and 1990 by 70-80%. Next are countries, such as Bangladesh, China, India, Indonesia, Philippines and Vietnam, that reduced infant mortality by 40-60%. At the other end are countries like Cambodia and Laos that had much smaller reductions in infant mortality.

Life expectancy, another indicator of health outcomes, underwent a transition similar to that of the infant mortality rate in much of Asia. There were dramatic increases in life expectancy, but with large intercountry variations. Cambodia, Bangladesh, Laos, Pakistan and the Philippines experienced relatively little change in life expectancy between 1960 and 1990. On the other hand, China, Thailand, Korea, Sri Lanka and Myanmar recorded extraordinary improvements in life expectancy during the same period.

Despite the remarkable progress made between 1960 and 1994, the fact is that infant mortality rates in South Asia (with the exception of Sri Lanka), Cambodia, Laos, and Myanmar are still unacceptably high (and approach

Table 7: Life expectancy and infant mortality in selected Asian countries, 1960 and 1994

	Average life expectancy at birth (years)		Infant mortality rate (infant deaths per 1,000 live births)	
Country	1960	1994	1960	1994
Hong Kong	66.2	79.0	43	5
Singapore	64.5	77.1	36	5
Korea	53.9	71.5	85	10
Thailand	52.3	69.5	103	29
Malaysia	53.9	71.2	72	12
Sri Lanka	62.0	72.2	71	16
Philippines	52.8	67.0	79	36
Indonesia	41.2	63.5	139	53
China	47.1	68.9	150	43
Vietnam	44.2	66.0	147	41
Myanmar	43.7	58.4	158	86
Lao PDR	40.4	51.7	155	93
India	44.0	61.3	165	74
Pakistan	43.5	62.3	163	80

Source: UNDP, *Human Development Report 1997,* 1997.

Table 8: Reported cases of AIDS, tuberculosis, and malaria in selected Asian countries, 1992-95

	Cases per 100,000 people of:		
Country	AIDS (1995)	Tuberculosis (1994)	Malaria (1992)
Hong Kong	0.8		
Singapore	2.0	51.3	10.8
Korea		85.7	
Thailand	30.5	82.7	199.4
Malaysia	0.7	59.4	202.5
Sri Lanka	0.1	35.9	2,045.4
Philippines	0.1	271.2	97.9
Indonesia		25.5	72.3
China		30.1	5.7
Vietnam	0.2	71.5	215.6
Myanmar	1.3	35.2	254.9
Lao PDR	0.1	24.0	882.3
India	0.1	122.0	241.6
Pakistan			69.8
Bangladesh		41.4	107.6
Cambodia	0.9	155.3	1,015.6

Source: UNDP, *Human Development Report 1997*, 1997.

ing levels found in Sub-Saharan Africa). There is thus a good deal of room for very large declines in infant mortality in these countries.

Morbidity. Data on morbidity and illness prevalence are notoriously difficult to obtain. They can only be reliably obtained from household health surveys, as facility-based data are biased and do not include individuals who are ill but who may not seek treatment for their illness. These reporting biases are evident in the data shown in Table 8, which show Sri Lanka to have one of the highest incidence of malaria in Asia. The high reported rate may simply reflect the fact that, on account of its well-functioning health-care system, the reporting rate of malarial cases is much greater in Sri Lanka than in, say, neighboring India. The data in Table 8 indicate that the Philippines, Cambodia, and India have the highest incidence of tuberculosis in the region.

The data in Table 8 also show the enormity of the AIDS problem in Cambodia, Myanmar, Singapore and Cambodia. Sentinel surveillance of pregnant women attending antenatal clinics also suggest that the HIV/AIDS epidemic is most severe in Thailand and Cambodia (Figure 21).

Child malnutrition. An indicator of child malnutrition that is used extensively in the literature is the proportion of children who are underweight for their age and sex. Data on this indicator are shown for selected DMCs for 1975-80 and 1990-96 in Table 9. As with infant mortality, most DMCs (with the exception of Myanmar) have reduced the prevalence of child malnutrition during the 1975-96 period. However, the prevalence of child malnutrition is still extraordinarily high in much of the region, with even countries such as the Philippines, Thailand and Indonesia having one-quarter to one-third of all children under 5 years underweight. It is extraordinary that even after 50 and 25 years of independence, one-half and two-thirds of all children under 5 are underweight in India and Bangladesh, respectively.

Table 9: Percentage of children under 5 years underweight for age and sex, 1975-80 and 1990-96

	Underweight children under 5 (%)	
Country	1975-80	1990-96
Thailand	36	26
Malaysia	31	23
Sri Lanka	58	38
Philippines	39	30
Indonesia	51	35
China	26	16
Vietnam	55	45
Myanmar	41	43
India	71	53
Pakistan	47	38
Bangladesh	84	67

Source: UNDP, *Human Development Report 1997*, 1997.

B. Health Inputs

An inadequate supply of preventive health services, such as immunizations and prenatal care, and an inability to provide prompt curative attention for early symptoms are thought to be important factors contributing to poor health status and high mortality rates in the poorest DMCs.[3] As a result, many DMCs have committed sizeable resources to establish large public health-care systems, most of which typically provide services at little or no cost to patients in order to promote access to health for all socioeconomic groups (de Ferranti 1985). However, health-care providers and programs often are concentrated in urban areas, and provide little

[3]Some observers have argued that places such as Sri Lanka, China and the Indian state of Kerala have primarily achieved low morbidity and mortality rates (relative to their per-capita incomes) by their success in sensitizing individuals to even minor illnesses and in getting them to seek early treatment (Caldwell et al., 1983; Panikar and Soman, 1984). Indeed, the experience of Kerala state in India suggests that high income and *even high nutrient intakes* may not be strictly necessary for low levels of mortality. Kerala has one of the lowest per-capita incomes and average calorie and protein intakes of any Indian state (Panikar and Soman, 1984: 26). Surprisingly, it also has the lowest mortality rates of any Indian state. This paradox is in part the result of Kerala's success in controlling infections, achieved largely via successful immunization programs and prompt curative intervention, made possible by easy accessibility of the rural population to primary health services (Panikar and Soman, 1984).

access to health services for the rural population, where the majority of the poor typically live. In addition, there is concern about the quality of the services provided by public health-care systems.

The provision of primary health services varies greatly from country to country. At one end are Laos, Myanmar, and the countries of South Asia (with the exception of Sri Lanka), which have the highest per capita availability of physicians (Table 10). At the other end are Sri Lanka, Indonesia and the Philippines, which have the lowest per capita supply of physicians. The data in Table x immediately suggest that there is little correlation between the per capita availability of physicians and actual health status in a country. Indeed, there appears to be an inverse relationship between the per capita availability of physicians and average health status.

Table 10: Population per physician and per nurse, selected Asian countries, 1988-91

	Population per:	
Country	physician	nurse
Singapore	725	
Korea	1,205	1,538
Thailand	4,762	1,064
Malaysia	2,564	
Sri Lanka	7,143	1,754
Philippines	8,333	
Indonesia	7,143	2,857
Vietnam	247	1,149
Myanmar	167	12,500
Lao PDR	118	4,545
India	136	2,439
Pakistan	102	2,000
Bangladesh	194	12,500

Source: UNDP, *Human Development Report 1997*, 1997.

While the *availability* of appropriate health services may (or may not) be important for improved health status of a population, it is clearly not sufficient. For the health care system to have an impact on health, individuals and households need to *utilize* health services effectively. A rough measure of overall utilization that is often used in the literature is the *annual number of contacts per capita with the health services* of a population. Obviously, an appropriate average level of annual health contacts per capita for a population depends on the age and sex distribution of the population as well as on the general incidence of morbidity. However, it is thought that an average of three to four annual contacts with the health services are adequate in achieving basic preventive health care goals (Gish *et al.* 1988, Gish 1989). For instance, this level of contact with mothers and children would assure a high level of immunization of the child population and proper monitoring of pregnancies and deliveries. A few developing countries, such as China and Sri Lanka, average four to five contacts per year (Gish 1989).[4] However, most others average less

[4]A survey in Sichuan province of China indicated an annual outpatient contact rate of 13.4 visits per capita (World Bank 1988: 5). This is an extraordinarily high level of contact, and comparable to the levels of contact in developed countries.

than one service contact per year.[5] Indeed, an average annual contact rate of less than one signifies that up to half of the total population (and a much larger proportion of the rural population) is effectively outside the health system, since the distribution of service contacts in many developing countries is extremely skewed.

C. Gender Differences

Particularly in South Asia, women do not have adequate access to primary health services, in part because of intrahousehold discrimination. Many of the studies analyzing health outcomes, especially in South Asia, have documented compelling evidence of poorer nutritional and health status for females than for males (Miller 1980, 1981, Sen and Sengupta 1983, Bardhan 1982,1984, Sen 1984, Kakwani 1986, Das Gupta 1987, Behrman 1988a,b). A number of studies also have documented higher post-neonatal morality rates for female relative to male children (Das Gupta 1987, Schultz and Rosenzweig 1982, Simmons *et al.* 1982). The greater incidence of poor health and mortality among female children does not appear to be the result of lower food or calorie intakes, but reflects general parental neglect in providing medical care for their female children (Das Gupta 1987, Alderman and Gertler 1988,1989). For example, Das Gupta (1987: 86) found that, while calorie intakes were roughly equal for male and female infants 0-1 years old, parents spent 134 per cent more on medicines for their male relative to female infants in rural Punjab. Alderman and Gertler (1988,1989) found that the demand for health care is more responsive to price for boys than for girls in Pakistan, so that girls are more vulnerable than boys to increases in health user fees. Alderman and Gertler also found higher income elasticities of health care demand for boys than for girls, suggesting that household income improves the utilization of health services by boys more than that by girls. If there is gender discrimination in the intrahousehold allocation of health services, it is clear that the mere provision of primary health services by public authorities will not have much impact on women's health. Aggressive attempts may need to be made to reach out to women, say, via mobile health teams.

D. Other factors

Factors responsible for the generally low utilization of health services, especially in the rural areas of developing countries, may include price, distance and quality. Some countries, often under pressure to reduce fiscal deficits as part of their structural adjustment and stabilization programs, have had to cut back health expenditures in real terms (Cornea, Jolly and Stewart 1987). As a result, these countries have attempted greater cost recovery in primary health care by charging user fees for health services. For instance, Indonesia doubled user fees for health centers in 1987 as part of its adjustment package.

Another reason for the low utilization of existing health services may be the abjectly low quality of health services in many developing countries. Since the total cost of using services includes the opportunity cost of time spent in traveling to health centers and waiting for treatment, lack of proximity to health facilities may also deter people from using health services. At any rate, it is

[5]Even in a middle-income country, such as Indonesia, the annual contact rate per capita is estimated to be as low as 0.3 - 0.5. Inpatient hospital admission rates are much lower (World Bank 1988: 5).

extremely unlikely that the low utilization of health services reflects a low *need* or *want* for medical attention. If anything, the high mortality and morbidity rates in many developing countries suggest that the true need for appropriate health services is great and largely *unmet*. Furthermore, the fact that the health-services utilization rates of individuals covered under health insurance schemes (who are typically public-sector employees in most developing countries) are often three to four times as large as the utilization rates for the uninsured population (Gish 1989) suggests that the 'true' demand for health services by the uninsured population might well be much greater if they had better access to health services.

The expansion of health-care systems requires substantial resources. Many DMCs are under increasing pressure to recover even more costs of primary health care by charging user fees. Recent research indicates that the demand for health services may be quite elastic with respect to price (Deolalikar 1998). There is also some evidence to indicate that the price responsiveness of medical care varies inversely with income, so that demand for health care among low-income patients is very price elastic while that among high-income patients is quite inelastic. If this is the case, not only would utilization of health services fall because of cost recovery, increasing user fees for health services could also price the rural poor completely out of the organized health-care system.

The functional distribution of government health expenditures in many developing countries also leave much to be desired. A much larger proportion of resources than justified goes to curative care, while preventive care in the form of communicable disease control and immunization programs typically receive token funding. Within the curative sector, hospitals, which typically cater to high-income and urban patients, generally have much larger allocations than public health centers and village health posts, which cater to low-income and rural patients. Even worse, when public health expenditures are cut back sharply, say because of a macroeconomic shock or an adjustment program, communicable disease control programs are among the first casualties, while expenditures on hospitals are relatively protected. For example, when public expenditures on health in Indonesia were slashed by nearly 50 per cent in real terms between 1983 and 1987 (the period of Indonesia's adjustment program), the brunt of the cut was felt most by communicable disease control programs (real expenditures on which fell by 75 per cent) and least by hospitals (real expenditures on which fell by only 23 per cent) (World Bank 1988: 19-20). The tuberculosis control program was virtually suspended, and malaria control activities were cut back extensively. This is contrary to standard economic principles that suggest greater priority of government funding for public goods, such as communicable disease control programs and immunization against communicable diseases, for which there is typically low private willingness to pay. On the other hand, since hospital care yields mostly private benefits, especially for higher-income individuals, the hospital sector least needs heavy government subsidies.

Similarly, the burden of health expenditure cuts often falls heavily on new investment and nonpersonnel recurrent expenditures, with relative protection for salaries and personnel expenses. Taking the case of Indonesia, again, the burden of budgetary cuts fell largely on investment expenditures, which fell by nearly 80 per cent in real terms between 1984-85 and 1987-88, and, to a smaller extent, on recurrent nonpersonnel expenditures, which fell by about 18 per cent in real terms during the same period (World Bank 1988: 18). Recurrent expenditures on staff salaries, however, increased by 32 per cent in real terms during the same time! Lower nonsalary recurrent expenditure means fewer outreach activities and inadequate supply of drugs and medical supplies at health facili-

ties. If existing investments, primarily those in health personnel, are to be better utilized, recurring expenditures on operations and management (including purchase of drugs and supplies) need to be increased, not decreased during periods of adjustment.

III. INTERNATIONAL COMPETITIVENESS

The notion of competitiveness is best captured by a firm's cost of production. The lower the unit cost of a firm relative to the costs faced by competing firms in other countries, the greater will be the international competitiveness of that firm.[6] There are in turn three factors that affect the relative cost of production: the nominal exchange rate, unit nonlabor costs, and unit labor costs. The more overvalued the local currency in a country, the greater will be the cost, as measured in international prices, of goods produced in that country and the less internationally competitive will be that country's firms. Likewise, higher land, capital, or infrastructure prices will drive up the unit nonlabor cost of goods and lower international competitiveness. Finally, the higher the unit labor cost of a firm or sector, *ceteris paribus*, the lower will that firm's or sector's international competitiveness.

Because most countries in Asia have historically had surplus labor, especially of the unskilled or semi-skilled variety, they have had low unit labor costs and have thus enjoyed international competitiveness in unskilled or semi-skilled labor-intensive goods. As a result, these countries' growth strategies have been based in large part on the export of unskilled labor-intensive goods and services. This has been especially true of countries such as Thailand, Malaysia and Indonesia, all of which have seen annual export (volume-based) growth rates of 10% or more between 1980 and 1995 (World Bank 1997). Most of these exports have been in agriculture- or resource-based industries or in labor-intensive, low-skill manufacturing industries, such as foods and beverages, textiles, footwear, toys, and wood products.

It has been argued that the recent currency crisis in these countries can be attributed, in some part, to their failure to move to higher value-added goods and services in the face of competition from countries such as China, Vietnam and India that have a cost advantage in unskilled labor. In particular, China has become a formidable player in low-skill manufacturing with its huge supply of unskilled labor and with its enormous expansion of manufacturing capacity in this sector during the last decade. The argument is that countries such as Thailand, Malaysia, Indonesia and the Philippines have been unable to move into higher value-added and higher-skill exports because of a weak human resource base (in particular, a short supply of secondary- and tertiary-trained workers).

How compelling is this argument? Before addressing this question, it is important to realize that the Southeast Asian currency crisis was precipitated by a number of factors, most of which were of a macroeconomic nature: high current account deficits, exchange rates that were pegged to the U.S. dollar (which in turn led to overvaluation of local currencies vis-a-vis European currencies, the Japanese yen and the Chinese yuan); overextended lending to the real-estate sector (which led to bank and finance-company failures).

Unit labor costs can be expressed as a ratio of average wage rates to labor productivity, i.e., annual wages per worker divided by value added per worker. This means that reducing worker compensation is not the only means of reducing unit labor costs; indeed, raising labor productivity is as, if not more, important for improving competitiveness (and raising living standards of workers). Human resource development -- i.e., improvements in nutrition, health and education – are likely to be important determinants of labor productivity growth.

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[6]See Krugman (1994) for a discussion on competitiveness.

Data from UNIDO have been used to calculate unit labor costs for 1990 for the manufacturing sector in 14 Asian countries (Figure 22).[7] In 1990 (more recent data are, unfortunately, not available), China had the lowest unit labor costs (16.1 cents for every dollar of value added), followed by Sri Lanka (17.6 cents). Indonesia, Pakistan, and the Philippines had the next lowest unit labor costs (averaging between 20 and 24 cents per dollar of value added). Hongkong, India and Taiwan had among the highest unit labor costs in the region (averaging between 41 and 55 cents per dollar of value added).

Figure 23 shows the two figures underlying unit labor costs -- viz., labor productivity per worker (i.e., value added per employee) and annual wages per employee -- for the same set of countries. This figure helps explain why Indian manufacturing's unit labor costs are more than two times those of Indonesia. The value added per worker in Indonesian manufacturing is about 50% greater than that in Indian manufacturing, but Indian manufacturing wages are about 50% higher than those in Indonesia.

Table 11: Unit labor costs (wages per unit value added) in manufacturing, Asia, circa 1990

	Total manu-factur-ing	Food & beverages	Textiles, apparel & footwear	Wood prod. & furniture	Paper prod., publish-ing & printing	Chemi-cals (incl petrol-eum, rubber, plastics)	Pottery, china and glass products	Iron, steel, & non-ferrous metals	Fabri-cated metal prod., machin-ery & equipment	Other manufact-uring
ISIC code	30	31	32	33	34	35	36	37	38	39
Bangladesh	0.329	0.151	0.320	0.396	0.417	0.183	0.251	0.346	0.391	0.175
China*	0.161	0.127	0.111	0.121	0.175	0.157	0.176	0.172	0.163	0.106
Hongkong	0.549	0.274	0.641	0.617	0.515	0.447	0.494	0.433	0.539	0.632
India	0.431	0.343	0.520	0.622	0.564	0.263	0.472	0.315	0.482	0.439
Indonesia	0.202	0.197	0.274	0.279	0.271	0.276	0.288	0.064	0.251	0.295
Korea	0.281	0.140	0.379	0.397	0.305	0.231	0.330	0.239	0.322	0.398
Malaysia	0.269	0.179	0.467	0.434	0.351	0.189	0.276	0.252	0.291	0.362
Pakistan	0.214	0.111	0.322	0.343	0.434	0.185	0.255	0.474	0.360	0.294
Philippine	0.240	0.133	0.499	0.456	0.299	0.205	0.290	0.111	0.394	0.505
Singapore	0.316	0.272	0.526	0.519	0.354	0.270	0.325	0.285	0.395	0.463
SriLanka	0.176	0.072	0.300	0.484	0.276	0.169	0.367	0.232	0.336	0.219
Taiwan	0.410	0.211	0.467	0.766	0.467	0.408	0.434	0.273	0.530	0.297
Thailand	0.283	0.172	0.347	0.331	0.340	0.272	0.346	0.390	0.370	0.257

Note: *Data for China are for 1986.

Source: UNIDO data base.

[7]Data have been averaged over four years. Thus, the 1990 data are averages for the years 1988 through 1992.

Unit labor costs are reported by 2-digit ISIC industries in Table 11. Generally, the same pattern discussed above holds across industries. China and, to a smaller extent, Indonesia and Sri Lanka, are observed to have among the lowest unit labor costs in most industries, while Hongkong, Taiwan and India have among the highest unit labor costs.

Table 12: Unit labor cost indices in manufacturing in selected countries, 1986-95

Country	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
China	100	97	95	91	91	87	82	77	74	
Hong Kong	100	91	95	95	94	82	76	79	78	67
India	100	85	77	63						
Indonesia	100	96	101	90	91	103	106	97	93	
Korea	100	110	117	146	158	172	180	180	181	177
Philippines	100	115	120	127	134	140	157	145		
Singapore	100	95	94	105	108	105	110	100	93	85
Sri Lanka	100	96	76	58	117	116	99	126	133	
Taiwan (China)	100	105	111	122	124	121	126	122	126	124
Thailand	100	106	87	83	88	99	104	100	90	
Japan	100	97	97	100	100	102	106	110	114	117
United States	100	97	93	92	92	92	91	90	87	82

Source: World Bank (1997).

Other data show the change in unit labor costs in manufacturing for selected Asian countries over the period 1986-95 (Table 12). These data show that unit labor costs fell most sharply in China -- at an average rate of 3.25% per year between 1986 and 1994. In contrast, unit labor costs fell by an average of only 0.88% and 1.25% per year in Indonesia and Thailand, respectively, and actually increased in a number of countries, including Sri Lanka, Taiwan, and the Philippines. Thus, relative to China, virtually all DMCs experienced an erosion of international competitiveness over the last ten years.

The ultimate test of international competitiveness is success in expanding world market shares. The relative increase in international competitiveness of Chinese manufactured exports certainly appears to have resulted in a more rapid growth of Chinese exports relative to exports from other

DMCs. Table 13 shows the market share of the 25 largest exporters of garments to the OECD in 1980 and 1994. In 1980, Hong Kong, Italy Korea, Germany and Taiwan were the largest exporters of garments to the OECD. China ranked eighth and had a market share of only 2.74%. By 1994, China had overtaken all of the seven exporting countries ahead of it, and had become the single largest exporter of garments to the OECD. It controlled 17.26% of the OECD market – more than two times as much as Hong Kong, which was the second largest garment exporter to the OECD.

Table 13: Major Asian Exporters of Garments to OECD

Country	OECD Market Share (%)	
	1980	1994
China	2.74	17.26
Hong Kong	13.72	8.01
Korea	9.13	4.72
India	2.09	3.19
Taiwan	6.62	2.81
Indonesia	0.21	2.44
Thailand	0.66	2.05
Philippines	1.41	1.72

Source: World Bank (1997).

IV. HUMAN RESOURCES AND INTERNATIONAL COMPETITIVENESS

A. The Benefits of Education

To what extent is international competitiveness in the production of goods and services associated with human resources? There is a large literature on the many economic benefits of education, and it is beyond the scope of this paper to survey this literature extensively. However, it may be worthwhile to note some salient findings from this literature

It is now widely accepted that schooling yields important pecuniary returns to individuals in the form of higher earnings. These returns can be rather large in developing countries. Based on a survey of the various estimates, Psacharopoulos (1994) has reported that private rates of return to schooling in Asia are as high as 39% for primary schooling, 18.9% for secondary schooling, and 19.9% for higher education.[8] Presumably, these high returns reflect the productivity-augmenting effect of schooling, which is recognized and rewarded by the labor market.

Recent estimates suggest that women face higher returns to schooling -- especially post-primary schooling – than men. Deolalikar (1993) reports that the private rate of return to secondary and university education is 25% greater for females than for males in Indonesia. A recent study for Cambodia finds that the private rates of return to primary schooling are 33% for men and 40% for women, but that the additional returns to post-primary schooling (over and above primary schooling) are significantly higher for women than for men (19.9% versus 5.7%) (UNDP, 1997a). A study of the productivity of men and women farmers in Sub-Saharan Africa also found the gain in productivity from education to be larger for women than men (World Bank 1988).

What could account for the large gender difference in the returns to secondary and tertiary schooling? Two explanations can be offered. First, if most salaried men are in occupations where physical strength is important (such as manufacturing or construction), the wage premium for men in unskilled factory positions (and with low schooling) would be considerable. The estimated returns to post-primary schooling would then be higher for females than for males. Both the Indonesia and Cambodian studies provide some evidence for this conjecture. For example, they find that earnings growth, although larger in magnitude for men early in the life cycle, falls off more rapidly beyond age 50 years for men than for women, which suggests that physical strength matters more for men. Schooling is often the only vehicle by which women can move out of low-paid, physically-demanding jobs. This is what happened in the United States from about 1880 to 1920, when women acquired secondary schooling and moved into clerical occupations in large numbers (Goldin, 1992). This trend appears to be already underway in Asia. Although secondary school enrollment rates are lower for girls than for boys in many DMCs, secondary school enrollments have been rising faster for females.

Another explanation for the higher observed returns to schooling for females may have to do with selection. The rate at which women are selected out of the paid labor force means that, at higher education levels, earners are more heavily selected towards the more talented.

While the high pecuniary rates of return to schooling in the form of higher wages may reflect the role of schooling as a screening device, there is also more direct evidence linking education to productivity. A survey of the evidence from eight developing countries revealed that the productivity

[8]The social rates of return to schooling are considerably lower, especially at the primary level, since most countries in Asia subsidize primary education heavily.

of farmers is on average 9 percent higher with four years of schooling than with no schooling (Jamison and Lau 1982). A more detailed study for Malaysia, Thailand and Republic of Korea found that a year of schooling was associated with a net increase in farm product of 5.1, 2.8 and 2.3 percent, respectively. Under various assumptions, the implied social returns to rural schooling are in the 25-40 percent range for Malaysia, 14-25 percent range for Thailand, and 7-11 percent range for Republic of Korea (Jamison and Lau 1982).

The productivity impact of education on the nonmarket time spent by women in home production activities is large as well. Numerous studies for a large number of countries in Asia have documented the significantly lower prevalence of child malnutrition and child morbidity and higher rates of child survival among children of literate mothers than among children of uneducated mothers. In addition, research on the determinants of fertility during the last two decades has shown that increased female education is the single most important variable in explaining fertility decline in virtually all developing countries (Birdsall 1988, Strauss and Thomas 1995).

There is a large empirical literature, spawned by the new growth theory, on the relationship between educational attainment and economic growth. The most visible empirical study in this area is the one by Barro and Sala-I-Martin (1995) which showed that the average years of secondary and higher schooling (for males) are significantly related to subsequent economic growth across a cross-section of countries. However, attainment at the primary level is not significant determinant of growth rates, while initial levels of female secondary and higher education are related inversely to growth rates. A large number of subsequent studies have confirmed that education contributes to technical change and hence economic growth.

There is also a literature on the relationship between scientific research and development (R&D) activities and economic growth. In agriculture, Pray and Ruttan (1990) have surveyed 16 studies that have measured the impact of public-sector agricultural research programs in Asia, and have concluded that the internal rates of return to such activity have been in the range of 25-100 percent. Although no such rate-of-return estimates exist for industrial R&D, a few studies have attempted to relate firm- and industry-level R&D to factor productivity growth. These studies also indicate positive and significant effects of firm-level innovative activities on total factor productivity growth (Goldar , Deolalikar and Roller 1989). In addition, of course, R&D generates substantial externalities because of spillover effects (i.e., R&D in one industry leading to productivity gains in other industries).

B. The Benefits of Health and Nutrition

Recent empirical research suggests that there may be substantial productivity gains, especially in agriculture, from improved health and nutrition in such varied settings as Sierra Leone, India, Bangladesh, Sri Lanka, and the Philippines (Strauss 1986, Deolalikar 1988, Sahn and Alderman 1988). For example, Strauss (1986) found that a 10% increase in average caloric intake was associated with a 3.4% increase in agricultural productivity among a sample of hoe farmers in Sierra Leone. For farmers having very low energy intakes (viz., 1,500 kcal. per person per day), the productivity effect was even larger -- a 10% increase in calorie consumption was associated with a 5% increase in agricultural productivity.

For a sample of cultivator and agricultural labor households in rural south India, Deolalikar (1988) found very strong effects of weight-for-height -- a medium-term measure of nutritional status --

on both farm productivity and individual wage rates. For instance, a 10% increase in weight-for-height was associated with a 20% increase in farm productivity and a 6.7% increase in individual wages rates.

Yet another study by Pitt, Rosenzweig and Hassan (1990) found that the nutritional status (in this case, BMI or body mass index) of workers increases the likelihood of their engaging in strenuous (and usually high-paying) work in rural Bangladesh. All of these studies thus suggest that the adverse effects on productivity of poor nutrition (as reflected either in inadequate calorie intake, low weight for height, or low body mass) may be considerable. In addition, there is a literature that demonstrates the long-term and lasting adverse effects of inadequate nutrition, especially among children, on their cognitive development and schooling performance (Jamison 1986, Moock and Leslie 1986), both of which in turn lower labor productivity in adulthood.

The productivity effects of nutrition and health are strongest at low levels of nutrition and income, and level off at higher income and nutrition levels. Consequently, it is unlikely that these effects are significant for workers in the manufacturing sectors of DMCs, since workers in urban-based manufacturing typically tend to be better-off than agricultural workers in most developing countries. Consequently, improved health and nutrition are likely to enhance the international competitiveness of agricultural goods and exports, although not of manufactured goods.

C. International Competitiveness, Technology Development, and Human Resources

While industrial R&D and technology development may not be important for building international competitiveness in low value-added, low-technology exports, it is critical as the industrial structure becomes more complex, and there is a shift to exports of higher value-added goods and services. Local R&D facilitates the import of foreign technology and improves its effective use. A study by Deolalikar and Evenson of Indian manufacturing found that technology imports and technology production were complementary inputs in production; in other words, industries that made extensive use of licensed foreign technology were also the ones that engaged in substantial technology production. Local technological capability enables better adaptation of imported technology to local conditions and raw materials availability, facilitates diversification into related activities, and promotes the diffusion of technology within the economy. This reduces the overall cost of importing new technologies.

There is an additional manner in which R&D capability can make the import of new technologies less costly. The international market for technology is different from that for goods in that there are generally no set prices for licensing or purchasing technologies. There is much greater scope for negotiation between the buyer and seller in setting the terms of technology purchase. Case studies from a number of developing countries have shown that enterprises with greater local technological capability are able to purchase foreign technology on better terms than less technologically-capable firms.

It is important to make a distinction between *adaptive* R&D and *applied* technological capability that reduces the cost and improves the effectiveness of imported technologies and basic R&D, which has few applications. Obviously, it makes sense in LDCs to go in for adaptive and applied R&D.

A recent study by Evenson and Singh (1997) uses data from 11 Asian countries over the period 1970-93 to study the determinants of GDP growth. Interestingly, they find that it is not just the stock of domestic R&D (i.e., domestic R&D expenditures accumulated over time) but also the stock of

'spillover' R&D undertaken internationally that has a strong positive effect on GDP growth. The magnitude of the international R&D effect on output is about one-half of the effect of domestic R&D, indicating that (i) knowledge and technologies are transmitted across countries, and (ii) the productivity effects of these international transmissions of technology and R&D are not trivial. One of their most interesting findings is that the productivity effect of international spillover R&D increases with the level of education and training in a country, indicating that "... country-specific efforts to improve the scientific ability of its manpower – that is, its domestic [technological] capabilities – induce [technology] spillover effects."

It is precisely for these reasons that countries such as Korea, Taiwan and Singapore have invested heavily in technology production and R&D, both in public institutions and in the private sector, while at the same time encouraging the import of new technologies from more developed nations. Some of the most sweeping technology development policies were pursued in Korea, which simultaneously encouraged import of technology and a comprehensive strategy of developing local R&D capability. While a great deal of technological activity in the initial years was spearheaded by government research institutes (often in collaboration with industry), Korea was successful in shifting the burden of research in later years to the large private conglomerates -- the *chaebol*. Taiwan went in for public provision of technological support to industry based on a system of extension and contract research undertaken by government research institutes for private industry.

Much as technology development, especially by locals, is a necessary condition for developing international competitiveness in high-end manufacturing, a strong base of tertiary and higher education, especially in the natural sciences, is a *sine quo non* of technology development. It is impossible to develop local technological capability in the absence of a higher education system that produces well-trained, high-caliber scientists, engineers, and technicians.

At the same time, it is important to recognize that while international competitiveness in high value-added manufacturing cannot be sustained without a supply of skilled scientific workers, the reverse is not necessarily true; i.e., a supply of highly-skilled workers will not automatically enable a country to become internationally competitive in high-end manufacturing. The Central Asian republics of Kazakstan, Uzbekistan and Kyrgyz are examples of countries that enjoy high ratios of secondary and tertiary enrollment, and have generally abundant supplies of skilled labor. However, these countries have not been successful in establishing international competitiveness in any high-skill industry. It is the combination of skilled and trained labor supply, macroeconomic stability, market orientation and discipline, and "outwardness" that enables a country to become internationally competitive in a skill-intensive industry. In addition, a niche product or market in which to develop export competitiveness often has to be identified.

A classic example of a DMC that developed export competitiveness in a niche industry is India. In absolute terms, India has always had a large supply of skilled workers, scientists and technicians (although, because of India's large population, this supply is small on a per-capita basis). However, India had developed export competitiveness in virtually no knowledge-based industries during the first four decades after its independence. With the liberalization of the economy in the mid- to late-1980s, a pro-active and technology-friendly government, and the enormous growth of personal computers in business in the United States and Europe, there was a big push toward establishing custom software as a niche product for export. Indian software exports have increased more than twenty-fold in the last few years, with annual software exports currently running at one billion dollars. Many large

companies in the United States and Europe have outsourced their inhouse custom software needs to India.

Obviously, the development of competitiveness in high-skill industries does not mean that low-skill industries need to be abandoned, especially by low-wage, surplus-labor economies. For the latter, stagnation in low value-added exports is premature and undesirable. These exports have great potential for growth in the manufacturing sector. After all, the rapid growth of Indonesia, Thailand and Malaysia during the 1980s and of Korea and Taiwan during an earlier period came about largely from growth in low-technology, consumer industries like apparel, toys, footwear, and wood products. The latter are far from 'sunset' industries in low-wage, surplus-labor economies.

For instance, there is some evidence that the Philippines has pursued precisely this approach. It has prematurely moved into higher-end exports at the cost of low-wage manufacturing exports. During 1991-96, Philippine electrical and electronic exports increased by 37% per year, while exports of textiles and garments increased by merely 8.2% – the slowest growth rate among all DMCs, with the exception of Korea and Taiwan (World Bank 1997). There was thus relative export stagnation in an industry that ought to be the mainstay of Philippine exports, since the Philippines, unlike most of its neighbors, remains a low-wage, labor-surplus economy. There is still great potential for export growth in such industries as garments, toys, leather goods and footwear for the Philippine economy. To make matters worse, Philippine exports in electrical and electronics exports have very low value added. They involve mostly final assembly of imported components. Average local content is only 15-25% in electrical and electronic manufacturing, as against 45% in Malaysia and 75% in Taiwan (World Bank 1997). Even worse, local content has not increased appreciably in the Philippines over the past two decades, indicating low technology development.

D. Empirical Evidence on the Relationship between Education and Competitiveness

As noted earlier, controlling for nominal exchange rates, international competitiveness is affected by both labor productivity (value added per worker) *and* wage costs (wages per worker). Improvements in education will thus increase export competitiveness only if they increase labor productivity at a faster rate than they increase wage rates. *Ceteris paribus*, developing countries are more likely than developed countries to be competitive in the production of goods and services that are labor-intensive, since they face lower wage structures. However, goods and services differ in the extent to which they use different grades or skill-levels of labor. Agricultural products, clothing, and footwear primarily use low-skill labor, while microprocessors and custom software is intensive in the use of high-skill labor. To the extent that primary and lower secondary education impart basic literacy and numeracy skills that enhance *general* labor productivity, while higher education endows workers with greater and more-specific skills, one would expect the expansion of primary education to be important in improving competitiveness in low-skill industries and higher education to be important in improving competitiveness in medium- and high-skill industries.

Figures 24 and 25 plot labor productivity and wage rates in manufacturing against mean schooling attainment for a cross-section of countries in Asia in 1990. A strong positive relationship between value added per employee and means schooling years is obtained (Figure 24). Indeed, the data suggest that the effect of schooling attainment on labor productivity increases with schooling attainment, such that an increase in mean schooling years from 7 to 9 is associated with a much larger increase in labor productivity than an increase in mean schooling years from 2 to 4. However, as

would be expected, earnings or wages per worker also increase quadratically with schooling (Figure 25). Consequently (and because unit labor cost is the ratio of wage rates to labor productivity) , there is a weak and statistically insignificant relationship between unit labor costs and schooling attainment (Figure 26).

E. The Role of Agricultural Extension

While much of the discussion so far has been on the development of export competitiveness in industrial products, it is important to note that the discussion applies to agricultural goods and services as well. Because crop yields and productivity in many low-income DMCs are well below potential levels, it will be much easier for these countries to increase yields and develop export competitiveness in agricultural products. Even within agriculture, it is possible to go from low value-added crops and products to higher value-added goods and services.

Table 14, which shows the yields of three major crops – wheat, rice and maize – in selected countries of Asia in 1996, indicates enormous variability in yields across countries. For example, with the exception of Indonesia, Azerbajian, Japan and Vietnam, every other country in Asia has rice yields that are less than one-half of the rice yield in South Korea. Similarly, China's wheat yield per hectare is nearly two times as large as that of Pakistan. There is thus a great deal of potential to further raise crop yields in most DMCs.

One effective way of improving export competitiveness in agriculture via training and human resource development is through extension. The primary objective of agricultural extension is to help farmers produce more output by teaching them improved farming practices, new techniques, and more productive technology packages. An agricultural extension system is a necessary interface between international and national agricultural research systems on the one hand and farmers on the other. A comprehensive extension system also performs other functions, such as providing assistance in marketing and supply of farm inputs, helping farmers form service or community organizations, and communicating the technical problems and needs of farmers to agricultural research organizations. The latter is a particularly important task in ensuring the relevance and usefulness of agricultural research to real-world issues and practical problems.

Table 14: Yield (kg.) per hectare in selected Asian countries, 1996

Country	Wheat	Rice, paddy	Maize
Bangladesh	19,529	26,621	10,091
Bhutan	7,143	16,667	8,667
Myanmar	9,417	32,224	15,089
Sri Lanka		28,012	10,690
Azerbaijan	15,791	40,500	9,333
India	24,926	28,281	14,081
Indonesia	35,484	45,151	23,617
Japan		61,905	25,000
Kyrgyzstan	23,045	19,444	39,956
Cambodia		17,386	13,333
S. Korea	39,193	68,505	40,299
Mongolia	7,236		
Lao PDR		25,528	19,118
Malaysia		31,288	18,000
Nepal	15,500	23,910	16,587
Pakistan	20,184	28,578	14,689
Philippines		28,558	15,175
Tajikistan	19,176	17,143	12,500
Turkmenistan	5,750	11,250	17,778
Thailand	6,455	23,644	31,543
Uzbekistan	15,640	30,000	33,333
Vietnam		36,027	18,929
China	37,320	62,059	52,029

Source: FAO database

While agricultural extension systems have been around in many developing countries since the late 1950s, there has been a renewed interest in agricultural extension throughout the developing world. A survey of agricultural extension systems in 113 countries, conducted by the FAO in 1988-89, indicated that over one-half of all agricultural extension organizations around the world were established or reorganized since 1970. There appears to have been a large increase in the number of agricultural extension workers as well. While a 1980 survey identified a total of 290,592 extension workers working in 138 agricultural extension organizations, the 1988-89 FAO survey identified 542,133 extension workers worldwide. More than 70 percent of these workers were located in Asia and the Pacific Region (Swanson *et al*. 1989).

According to the FAO survey, agricultural extension expenditures worldwide constituted approximately 0.9 percent of agricultural GDP in 1988. However, this ratio declined between 1980 and 1988. Thus, the apparent expansion of extension activities in recent times, as reflected in the increased number of extension organizations and workers, seems to have taken place concomitantly with declining average expenditures per extension worker. If the downward trend in real extension expenditures continues, the impact on extension programs and staffing could be serious.

There are several approaches to agricultural extension that have been tried out in various countries over the years. These include (i) the general agricultural extension approach, (ii) the commodity specialized approach, (iii) the training and visit (T&V) approach, (iv) the agricultural extension participatory approach, (v) the project approach, (vi) the farming systems development approach, (vii) the cost-sharing approach, and (viii) the educational institution approach. Each of the approach differs in terms of its assumptions about farmers' problems and behavior, and in terms of organizational set-up, degree of centralization, extent of cost-sharing and farmer participation, and focus on a particular commodity or crop. While a detailed analysis of the merits and demerits of each approach is beyond the scope of this paper,[9] it should be emphasized that there is no single approach that is universally appropriate. Depending upon the nature of local problems and the capabilities of the local agricultural research establishment and the extension system, different approaches may work in different settings. Indeed, the eight approaches listed above are not mutually exclusive, and many countries often employ combinations of the various approaches. FAO's recently-introduced Strategic Extension Campaign is an example of a combination of methods that offer considerable promise.

The contributions of agricultural extension have been widely documented around the world. The rapid spread of high-yielding varieties of wheat, corn, and rice in large parts of Latin America, Asia and, to a minor extent, Africa (in what came to be known as the Green Revolution) was in large part the result of agricultural extension workers in these countries effectively disseminating information about the improved seeds and the fertilizer and water requirements of the new technology to farmers. The Masagana 99 Program in the Philippines, the BIMAS program in Indonesia, and the agricultural extension system of Republic of Korea established in the late 1950s are additional examples of extension programs that have been successful in raising farm yields and farm income.

Evenson and Kislev's (1975) pioneering study of agricultural extension in India remains one of the few studies to have empirically estimated the internal rate of return to public expenditures on extension. Using data on agricultural productivity and public expenditures on agricultural research and extension for 15 Indian states between 1953-54 and 1970-71, Evenson and Kislev estimated the

[9]See Axinn (1988) for a review of the different approaches.

marginal rate of return to investment in extension to be 17.5 percent, after controlling for investment in agricultural research (Evenson and Kislev 1975). While this rate of return may appear modest, it is likely that it is substantially underestimated, since it is often difficult, if not impossible, to separate the productivity effects of agricultural extension from those of agricultural research due to the strong complementarity between the two activities.

More recently, FAO (1989) has calculated simple cost-benefit ratios[10] for selected extension programs in developing countries. The major finding from this study is that the cost-effectiveness of an agricultural extension program depends largely on the extension approach followed in the program. For instance, approaches that embrace large numbers of farmers, such as general, participatory, and T&V, have lower per-farmer costs and therefore lower cost-benefit ratios. On the other hand, approaches that maintain high agent/farmer ratios, such as project and specialized commodity, have higher per-farmer costs and therefore higher cost-benefit ratios. The cost-benefit ratios calculated by FAO from case studies of selected approaches within countries (and thus not representative of entire countries) ranged anywhere from a low of 1:1 for Rwanda to a high of 1:32 for the Philippines. An FAO assessment of the Farm Modernization Scheme in Ireland found that those participants in the Scheme with advisory contact expanded the size of their business by 56 percent, while participants with no advisory contact expanded their business by only 19 percent. On the other hand, nonparticipants actually experienced contraction of their business by 17 percent. The rate of return to resources used in the extension service was estimated to be 25 percent.

[10]These were defined as the annual cost of the extension operation divided by the increase in annual value of production.

V. FINANCING HUMAN RESOURCE AND TECHNOLOGY DEVELOPMENT

If human resource development (including agricultural extension) and technology development (including adaptive R&D) are important for establishing international competitiveness, how should these activities be financed and implemented? It is clear that, *even if they wanted to*, governments simply could not take on the *exclusive* responsibility for providing social services (such as education and health) and conducting R&D, since most DMC governments today are seriously short of funds for financing social expenditures.

Economic theory suggests that governments should take on the primary responsibility for financing public goods – goods that generate substantial externalities and for which the private willingness to pay is limited -- but not private goods. Primary education is often considered a public good because of its large social benefits (viz., lower fertility, improved public health and hygiene, and informed electoral participation). On the other hand, the benefits of secondary and higher education accrue largely to individuals, who typically are willing to pay for such education. There is thus a case for stronger public support of primary education relative to secondary and higher education. Likewise, agricultural extension and training is an activity which almost always has to be provided publicly.

Indeed, the success of the East Asian tigers was at least in some part due to their educational policies, which focused on public financing of primary education and agricultural extension and private financing of secondary and higher education (World Bank 1994).

There are many kinds of health and nutrition interventions that have strong public-goods characteristics. These include the supply of safe drinking water and sanitation, as well communicable disease control programs. These interventions are also much more cost-effective than other health and nutrition interventions, such as curative health interventions and nutrition supplementation programs. Clearly, then, these are the activities that governments should finance.

The case of technology development is more complex. Technology development has elements of both a public as well as a private good. As argued earlier, an enterprise importing technology will be able to import technology on better terms and be better able to absorb and assimilate this technology (thereby lowering its production costs) if it engages in some amount of technology development and adaptive R&D. Since it is able to appropriate the benefits of its technology development activities, it will be willing to pay for these activities. However, since technology development and R&D have large inter-industry and inter-firm spillover effects (i.e, benefits that are appropriated by firms and industries other than the one undertaking the technology investment), there will be a tendency for firms to underinvest in these activities. In this sense, technology development and innovative activities are public goods.

Clearly, in all of the countries that have moved into higher value-added manufacturing and exports in recent times (such as Korea, Taiwan, and Singapore), there was strong government support of technology development and innovation, including establishment of special R&D institutions.

VI. STRATEGIES, OPTIONS, AND INTERVENTIONS

A. Broad Strategies

Obviously, the policy strategies for improving international competitiveness will be different for each set of DMCs based on their current socioeconomic situation. For the lowest-income DMCs, such as those in Indochina and South Asia, where wage costs are still relatively low, the focus should be on raising labor productivity in low value-added industries, such as agriculture, forestry, fisheries and low-technology manufacturing (e.g., agro-processing, food and beverages, footwear and apparel, textiles, etc.). Productivity in these industries (including crop yields in agriculture) is still very low, and there is a great deal of potential to raise productivity – and thereby international competitiveness – further. These countries are characterized by high levels of adult illiteracy, less-than-universal primary schooling, and high levels of malnutrition and morbidity. The high levels of adult illiteracy (often amounting to as many as one-half to two-thirds of all adults being illiterate) and malnutrition are a drag on productivity growth. Consequently, this group of DMCs can realize large improvements in productivity through targeted basic literacy programs, expansion of primary schooling opportunities, and improvements in the quality of primary education. In addition, farmers as a group in these DMCs need to be targeted via agricultural extension programs that can teach them improved farming practices and new cropping techniques and introduce them to more productive technology packages. Finally, in this group of countries, targeted policies to combat malnutrition and morbidity would have high pay-offs in the form of increased agricultural productivity.

Among middle-income DMCs, such as the countries in Southeast Asia currently facing financial crises, a different set of human resource policies are needed. These countries need to move to the next stage of development to more sophisticated products in higher value-added categories, as their competitiveness in unskilled and low-skill labor-using goods and services has eroded. With rapid growth during the last two or more decades, unskilled wages in these countries have increased to the point where these countries simply do not have a cost advantage in unskilled labor over the first group of (low-income) DMCs. To develop international competitiveness in higher value-added manufactures, these countries have to address deficits and shortcomings in secondary and tertiary-based education, training, and R&D.

There are three areas in which this group of DMCs need to focus. First, while these countries enjoy universal primary enrollment rates, their secondary and tertiary enrollment ratios are relatively low (with the exception of the Philippines). Thailand, in particular, has an unusually low secondary enrollment ratio, while Malaysia and Indonesia have unusually low tertiary enrollment ratios. Unless these ratios increase substantially, they could act as a binding constraint on the ability of these countries to move into higher value-added manufacturing.

Second, this group of DMCs will need to introduce greater technical and vocational orientation in their secondary education and a greater emphasis on basic and applied science and technology in the tertiary-based curriculum. Such an orientation is almost a prerequisite for developing export competitiveness in higher value-added manufactured goods and services. Perhaps due to its British-based education model, Malaysia has a very low proportion of its secondary-school students in technical and vocational education. Indonesia and Thailand have smaller proportions of tertiary students in applied and science fields than even Bangladesh and India.

Third, besides having a weak science and technology base, this group of DMCs grossly underspend on national R&D programs. Indeed, national R&D expenditures in Thailand, Indonesia and the Philippines, expressed as a proportion of GNP, are only one-quarter or less of those in India (and one-fourteenth of those in Korea). The experiences of Korea and Taiwan clearly underscore the importance of having a solid R&D program to develop competitiveness in higher value-added industries. Indeed, the higher value-added industries of the next 2-3 decades are likely to be even more knowledge-, technology- and information-based than those of the past 2-3 decades, so these countries will need to invest even more in R&D and technology than Korea and Taiwan did during the corresponding stage of their development (viz., in the 1970s and 1980s). There is some evidence that some of the middle-income DMCs -- Malaysia in particular -- have realized the importance of technology, and have begun making large, targeted investments in this area.

It goes without saying that it is virtually impossible to have a strong national R&D and technology program without having a higher education system that can produce well-trained and qualified scientists and technicians. This further underscores the importance of expanding both the quantity as well as the quality of secondary and tertiary education and emphasizing scientific and applied fields of study among tertiary students.

The final group of DMCs are those in the transition economies -- especially the Central Asian Republics. Because of their socialist backgrounds and their past association with the erstwhile U.S.S.R., these countries are generally well-endowed with skilled manpower. They enjoy high rates of secondary and tertiary enrollment, and have strong technology and science orientation in their educational systems. However, because these countries were isolated for so long, they were unable to use their trained manpower to develop international competitiveness in knowledge-based industries. These countries will need to identify niche products and areas in which they have a distinct cost advantage, and will need to make their R&D and higher education programs more market-relevant. These countries need to draw lessons from the successful experience of India in using its vast supply of low-cost scientists, technicians and programmers to become a major international exporter of computer software.

B. Operationalizing Human Resource and Technology Development Interventions

How should DMCs operationalize the broad strategies and options discussed above? In this context, it is important to list some important issues that need to be kept in mind while designing specific human resource development interventions.

Targeted programs to raise enrollments. Clearly, in the least-developed DMCs, access to primary education needs to be expanded, especially for special groups like girls and children from low-income backgrounds who have low enrollment rates. However, improved access does not always mean establishment of new school facilities by the public sector. Often, what is needed are new approaches to encourage low-enrollment groups to attend and stay in school -- such as establishing female teacher training schools, educating girls at night (as in India), and providing scholarships to girls (as in Bangladesh) and to low-income students. Targeted assistance in the form of scholarships, bursaries or loans can go a long way toward improving access to primary education, especially among those groups that have the lowest enrollment rates.

Partnership with communities and the nongovernment sector. If an expansion of school facilities is required, it is generally more efficient for governments to (i) locate these facilities in regions where the nongovernment sector is unwilling to invest in school facilities, and (ii) build and run schools in close partnership with communities. Experience from all around the world has shown that schools are likely to be more sustainable and impart education of higher quality when local communities have an ownership and management stake in these schools. Since there is a strong demand for private and NGO schools among middle- and higher-income households, there is little or no need for governments to become exclusive providers of education.

Improving schooling quality versus quantity. Another issue that is important in both the least-developed as well as the middle-income DMCs is that of schooling quality. Schooling quality remains abysmally low in most of these countries. The low quality of schooling is the result of many factors, including the poor quality of teachers (reflecting poor teacher training and lax teacher training requirements), low teacher morale (caused in large part by extremely low teacher salaries), low expenditures on nonsalary items (such as learning aids, textbooks, and other teaching materials), and large class sizes. It results in high rates of grade repetition and drop-outs and in poor performance of students in examinations. Clearly, improvement in schooling quality is an important objective of educational policy in developing countries.

However, there can sometimes be a conflict between expanding quantity and improving quality. A recent study for Kenya suggests that policies that serve to expand the number of school facilities increase the net primary enrollment rate of the poor much more than that of the nonpoor (Deolalikar 1998), implying that primary school spaces are rationed to the poor, or that an increase in the number of schools is likely to lower schooling costs (i.e., the equilibrium "price" of schooling) for poor households and thereby improve their rates of enrollment.

On the other hand, an improvement in the quality of primary schools (via an increase in the teacher-pupil ratio) has exactly the opposite effects on enrollment. It reduces primary enrollments among poor children, especially in the rural areas, but increases enrollments of richer children, particularly those residing in urban areas. Why would an improvement of the teacher-pupil actually *reduce* the enrollment rate for poor children? One reason might be that improvements in the teacher-pupil ratio might take place at the expense of other schooling inputs, such as bursaries and scholarships, that primarily help poor students attend primary school. Another reason might be that improvements in the teacher-pupil ratio at the community level are often financed out of higher user fees and supplements, which in turn can have an adverse effect on the enrollment rate of poor children (if the price elasticity of demand for schooling is more negative for the poor than for the nonpoor).

These results suggest that in countries where there is less-than-universal primary enrollment, expansion of access to primary schooling might be a more pressing concern than improvement in quality. On the other hand, in middle-income DMCs which already have universal primary enrollment, improving the quality of primary education should be the overriding concern.

Achieving better resource allocation across schooling levels. Microeconomic research indicates that the returns to schooling are much higher at the primary and lower secondary levels than at the upper secondary and university levels, especially in the lowest-income DMCs. In these countries, therefore, internal efficiency within the education sector would be enhanced by allocating

a larger share of public resources to primary and lower secondary education. Such an allocation would also, of course, be more equitable, since the individuals who attend primary and lower secondary schools in most DMCs are typically less affluent than those that obtain upper secondary and higher education.

However, among the middle-income DMCs, which already have universal primary enrollment, spending on higher levels of education needs to be increased. As noted earlier, there is some evidence to indicate that these countries have underfunded secondary and higher education. Again, the strategy in these countries should be to rely as much as possible on the private and nongovernment sectors in the provision of education, but to use public funds for targeted scholarships and incentives that will raise enrollments in secondary and higher-education institutions.

Eliminating constraints to private-sector provision. In many countries, there are explicit and implicit restrictions -- such as regulatory constraints, more stringent financial requirements, and stricter standards -- on the operation of the private and NGO sectors in the provision of education and health. These constraints often mean that there is no level playing field between government and nongovernment providers of social services. The opportunity cost of these restrictions is high, because the presence of nongovernment providers in the health and education sectors not only improves household access to schooling and health opportunities at little or no cost to the government; it also introduces competition and thereby the quality of social services provided.

Investing in environmental hygiene and communicable disease control. The disease pattern in most South and Southeast Asian DMCs is characterized by a predominance of communicable diseases and water- and food-borne infections. As is well known, these diseases can be managed by known and relatively inexpensive public-health interventions, including vector control, health education, environmental health, immunizations, and screening. One of the key messages in health economics is that such interventions should have the first claim on public resources due both to the substantial externalities they create for the society and to under-spending on them by private agents. However, with one-half to three-quarters of the government health budget in most DMCs going to curative services to treat these diseases and other, much lower-priority health problems, there is considerable scope for improved expenditure allocations relative to a more economically sound mix of services.

HIV/AIDS deserves special attention since several DMCs have among the most serious HIV epidemics in the world, and the economic and human implications of HIV/AIDS for these countries in the near future could be staggering. Sentinel surveillance of pregnant women attending antenatal clinics shows that the HIV/AIDS epidemic is most serious in Thailand, Cambodia, Myanmar, India and Laos.

In addition to the enormous human cost of HIV/AIDS in terms of suffering, loss of livelihood and disruption of families, the disease has a very real economic cost. The direct costs of AIDS include the public and private costs of (i) prevention (including testing the blood supply), (ii) treatment and care, (iii) funerals, and (iv) caring for AIDS orphans. The indirect cost of AIDS is the value of output lost by society because of the premature mortality of AIDS victims. The indirect cost is large because AIDS mostly affects young adults of prime working (and earning) age.

Myers *et al.* (1997) have calculated the indirect economic costs of AIDS in Cambodia, based on projections of the spread of the disease (Figure 27). These range from a low estimate of $1.97

billion to a high estimate of $2.82 billion over the period 1997-2006. If direct costs are added, these figures would increase even more. These colossal amounts indicate how seriously the AIDS epidemic could affect the poorest DMCs in the absence of serious intervention.

R&D institutions. One way in which technology development can be promoted is via special R&D institutions. This is the approach that was followed by Korea. The government set up a number of institutions to promote technology development. In 1966, it established the Korean Institute of Science and Technology (KIST) to undertake applied research for industry. In its early years, KIST concentrated on solving the simple problems associated with technology transfer and absorption. In the 1970s, the government set up other specialized research institutes on machinery, metals, electronics, nuclear energy, resources, chemicals, telecommunications, standards, shipbuilding, and marine sciences, among other areas, many of which were spun off from KIST. By the end of the 1970s, there were 16 R&D institutions, some of which were later consolidated under the Ministry of Science and Technology in 1981. An important reason for the success of the R&D institutions in Korea was that they worked in close partnership with industry. Similar technology and R&D institutions in India have not worked as well, because a close partnership with industry was not fostered. As a result, these institutions have produced research and technologies that have not found many applications in industry.

Increasing reliance on the private sector for R&D and technology development. While it may be necessary initially for governments to take the initiative of technology promotion and development, eventually technology development needs to be undertaken by firms and enterprises. Again, the experience of Korea is relevant to many DMCs. In the early 1970s, nearly three-quarters of the national R&D budget was spent by the government. By the early 1990s, 80% of the R&D expenditures were spent in the private sector. (Because R&D is lumpy and often risky, R&D expenditures are highly concentrated; it is estimated that, in 1995, 20 *chaebols* accounted for 80% of the total private R&D in Korea.)

Vocation and technical education and training. Case studies of 17 countries undertaken recently by the World Bank and ILO show that when government policies relating to vocational and technical training are designed to encourage rather than supplant the private sector, there *is* usually a strong private-sector response. For example, when public funding mechanisms require public providers to compete on the same terms with private trainers, private training institutions end up with a large share of the market for vocational education programs. The study indicated that clear and balanced legislation on training was more important for an expansion of vocational training than government subsidies to that sector. Another important finding of the study was that government preoccupation with providing, regulating, or financing vocational training often results in governments neglecting their role as providers and facilitators of information on the availability and effectiveness of vocational programs. An expansion of this role is often the most effective way for governments to further the development of an appropriate and cost-effective vocational education and training system.

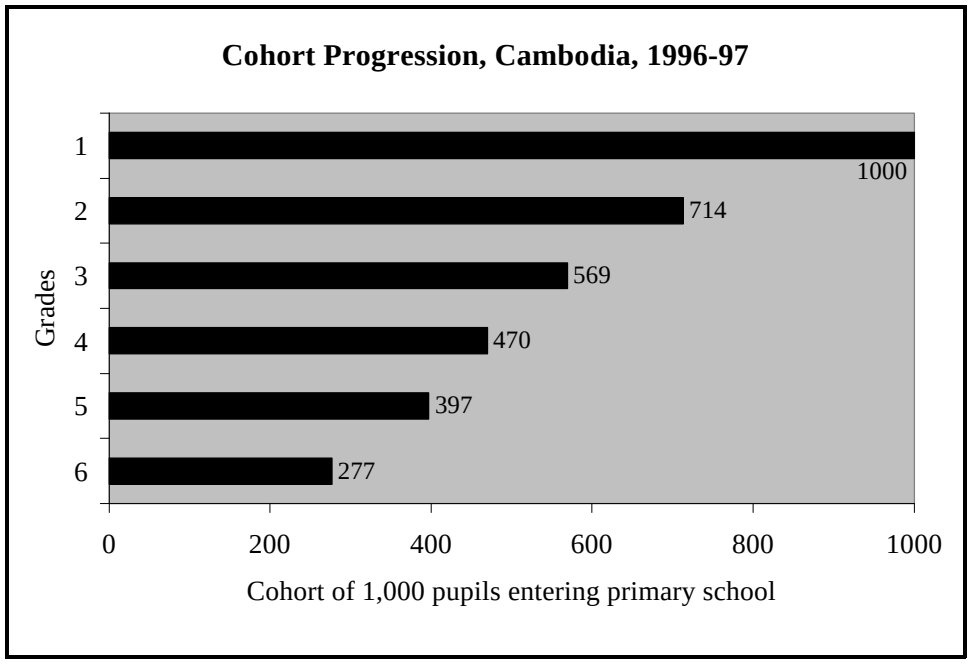

Figure 1
Source: Ministry of Education, Youth and Sports, Royal Government of Cambodia, 1997.

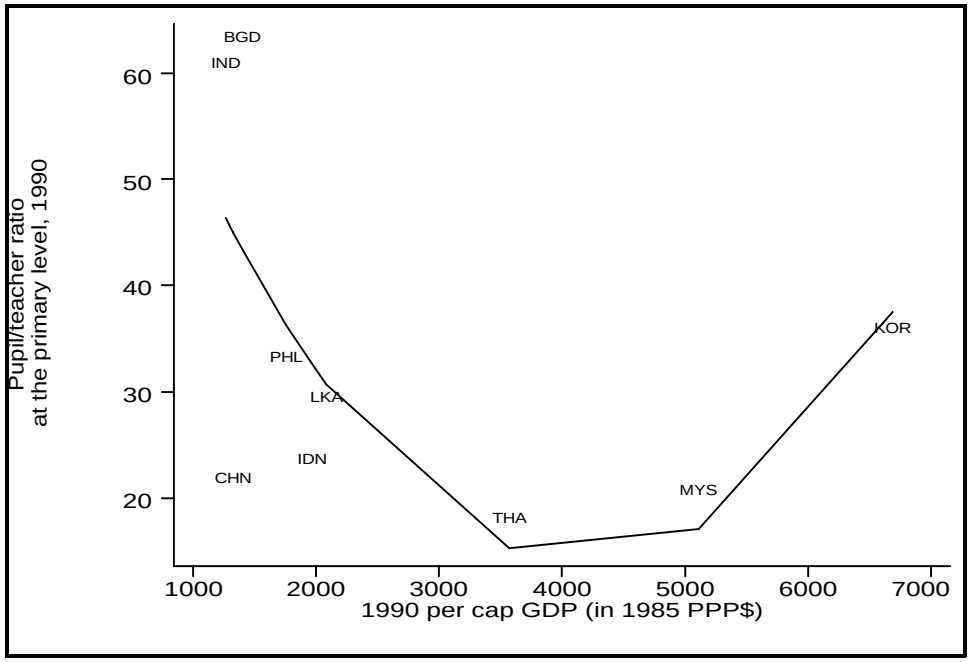

Figure 2: Pupil/teacher ratios at the primary school level, selected Asian countries, 1990
Source: Database of Barro and Lee, 1996.

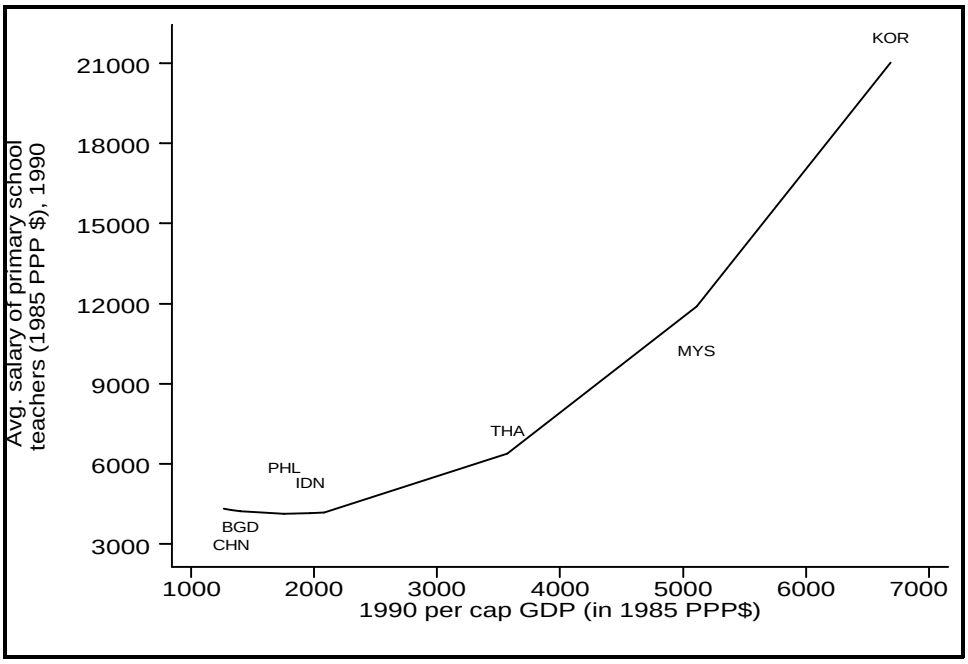

Figure 3: Average salary of primary school teachers (in 1985 PPP $), selected Asian countries, 1990
Source: Database of Barro and Lee, 1996

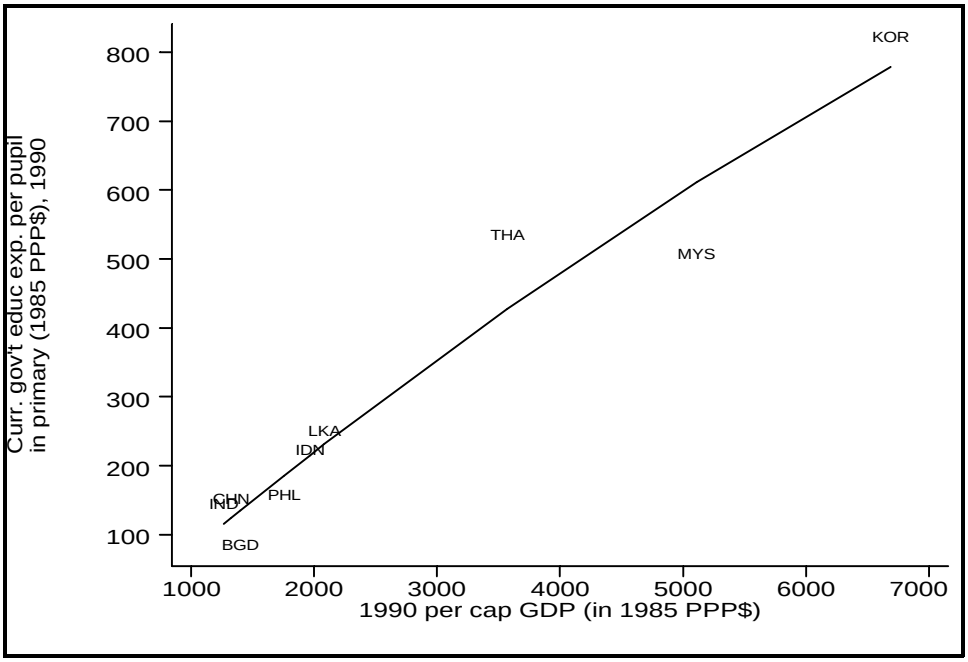

Figure 4: Current government education expenditure per pupil on primary education (in 1985 PPP dollars), selected Asian countries, 1990
Source: Database of Barro and Lee, 1996.

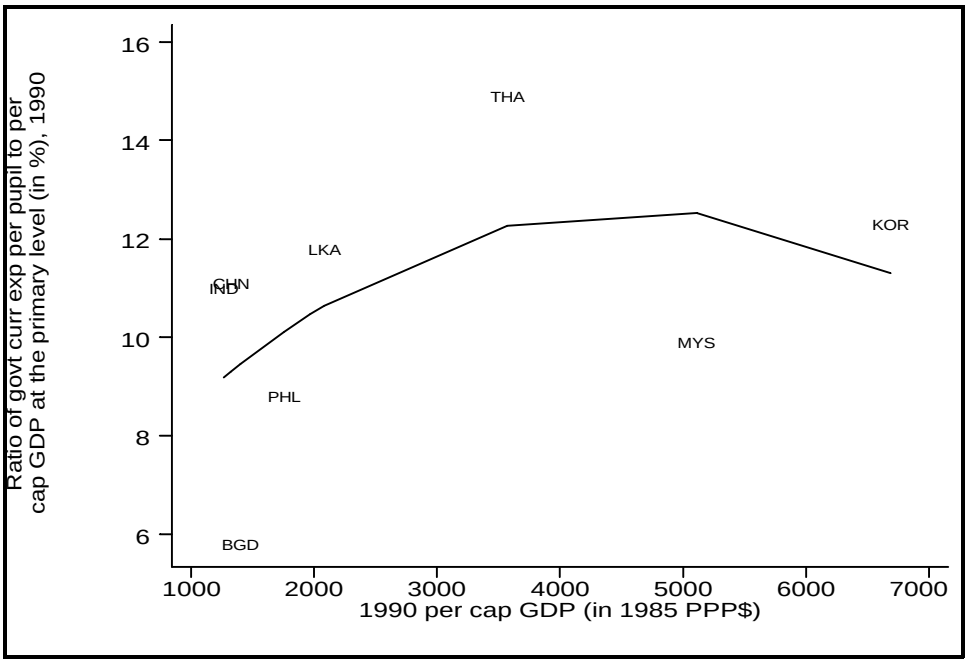

Figure 5: Ratio of government current educational expenditure per pupil to GDP per capita at the primary level, selected Asian countries, 1990
Source: Database of Barro and Lee, 1996.

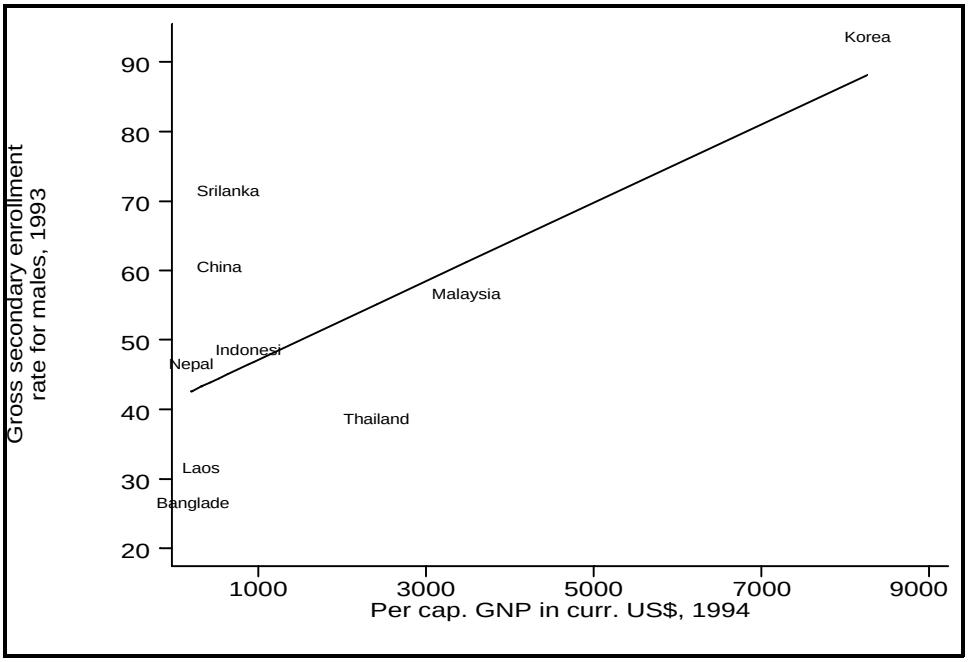

Figure 6: Gross enrollment rate at secondary level for men, selected Asian countries, 1993
Source: World Bank, 1997

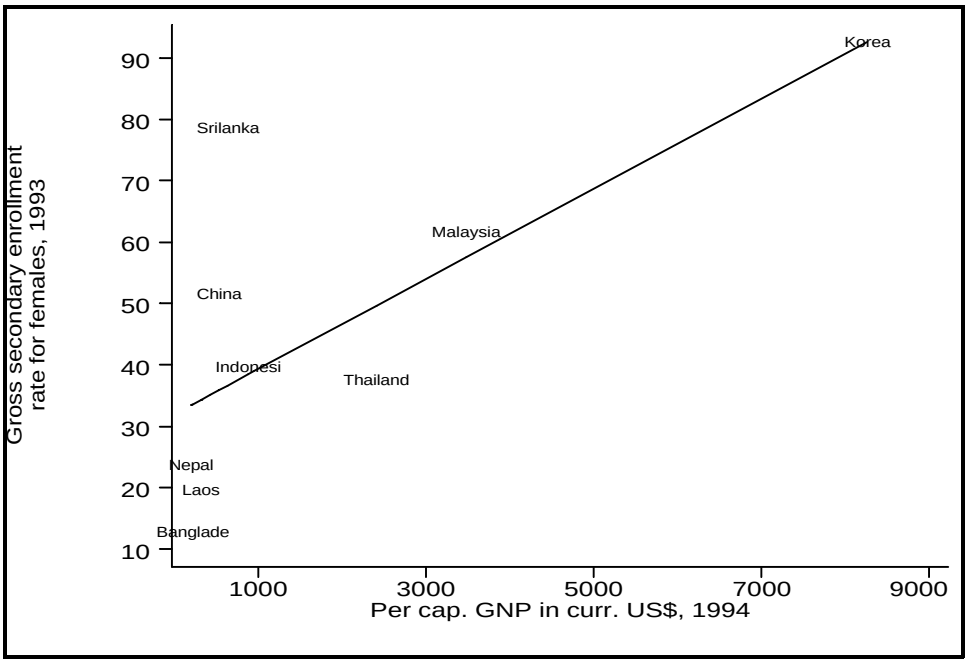

Figure 7: Gross enrollment rate at secondary level for women, selected Asian countries, 1993
Source: World Bank, 1997

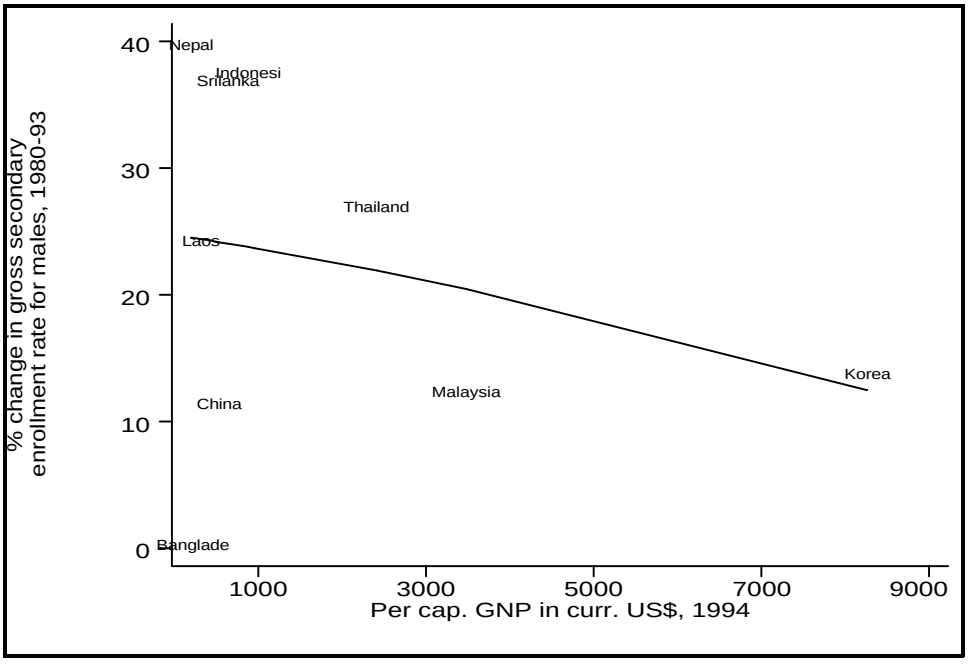

Figure 8: Percentage increase in gross secondary enrollment rate for men, selected Asian countries, 1980-93
Source: World Bank, 1997

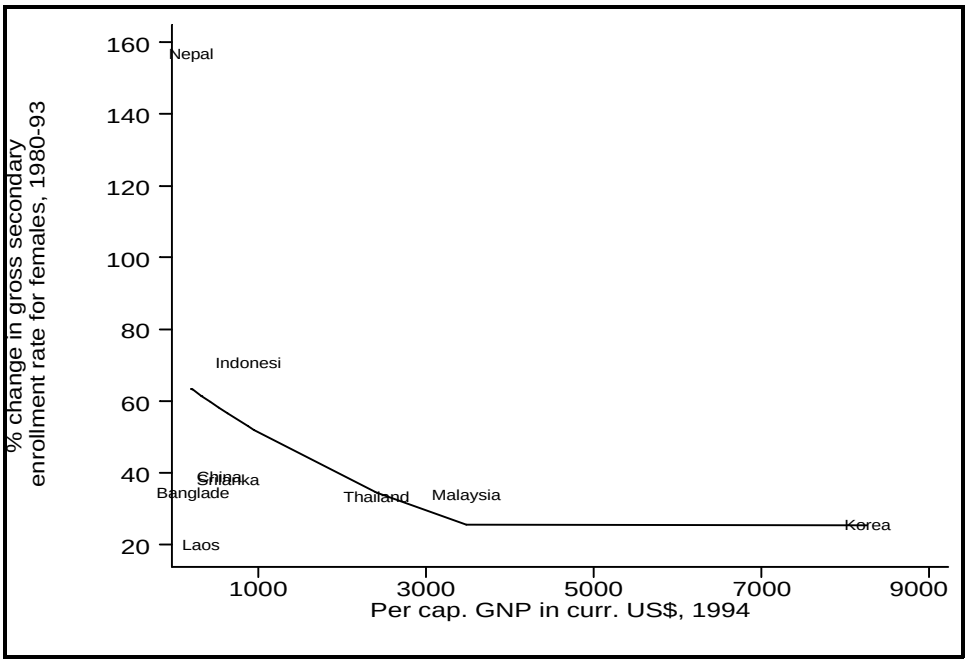

Figure 9: Percentage increase in gross secondary enrollment rate for women, selected Asian countries, 1980-93
Source: World Bank, 1997

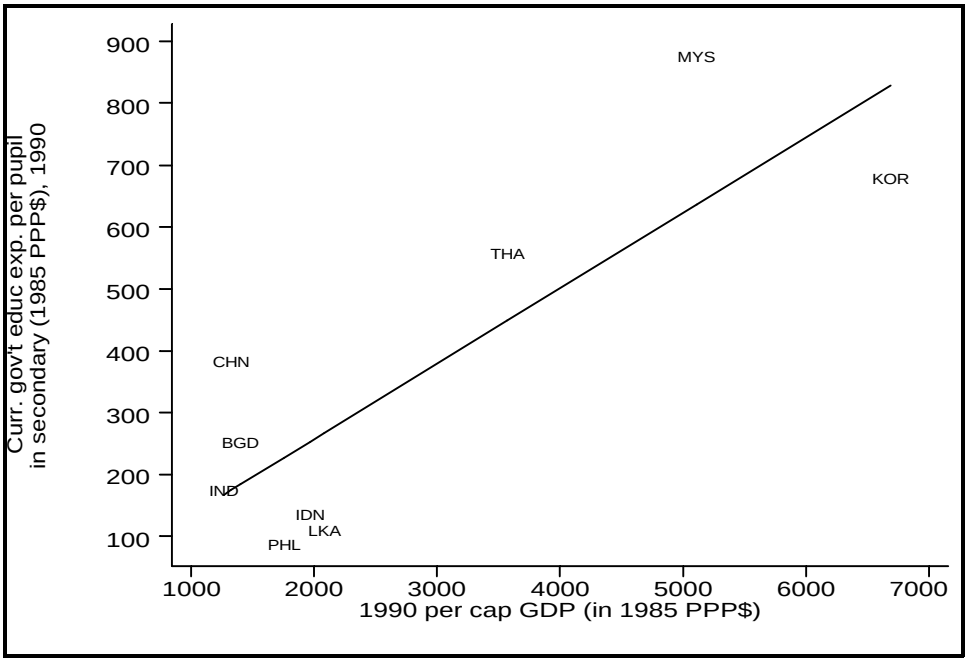

Figure 10: Current government education expenditure per pupil on secondary education (in 1985 PPP $), selected Asian countries, 1990
Source: Database of Barro and Lee, 1996.

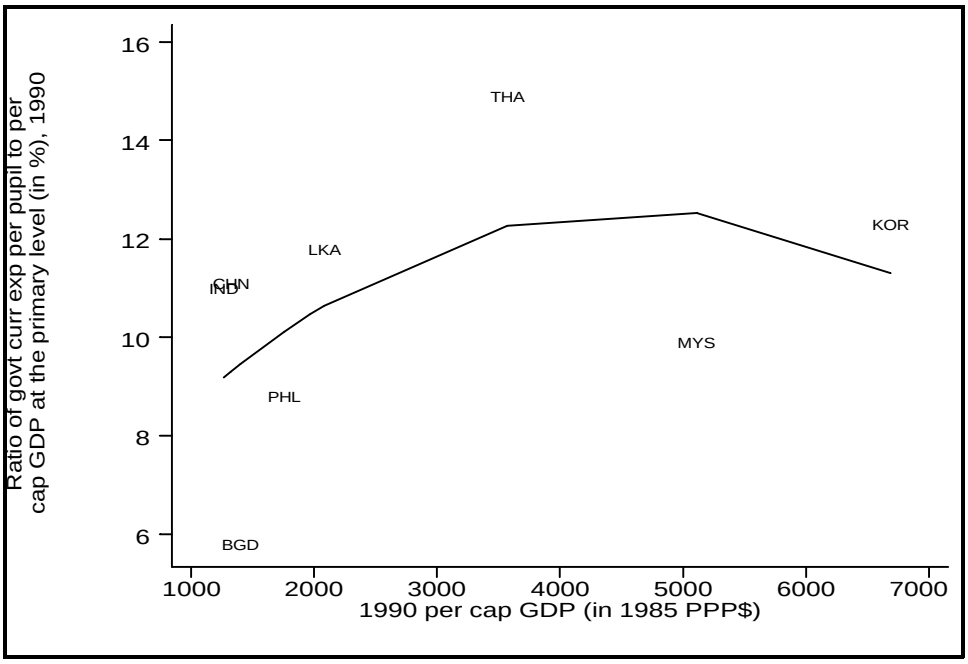

Figure 11: Ratio of government current educational expenditure per pupil to GDP per capita at the primary level, selected Asian countries, 1990
Source: Database of Barro and Lee, 1996.

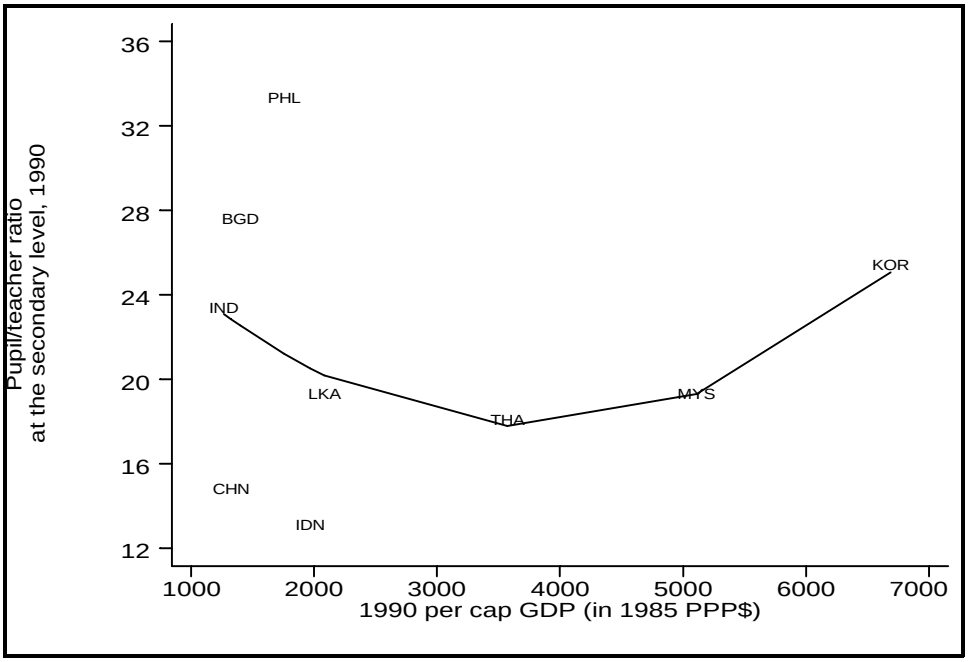

Figure 12: Pupil/teacher ratios at the secondary level, selected Asian countries, 1990
Source: Database of Barro and Lee, 1996.

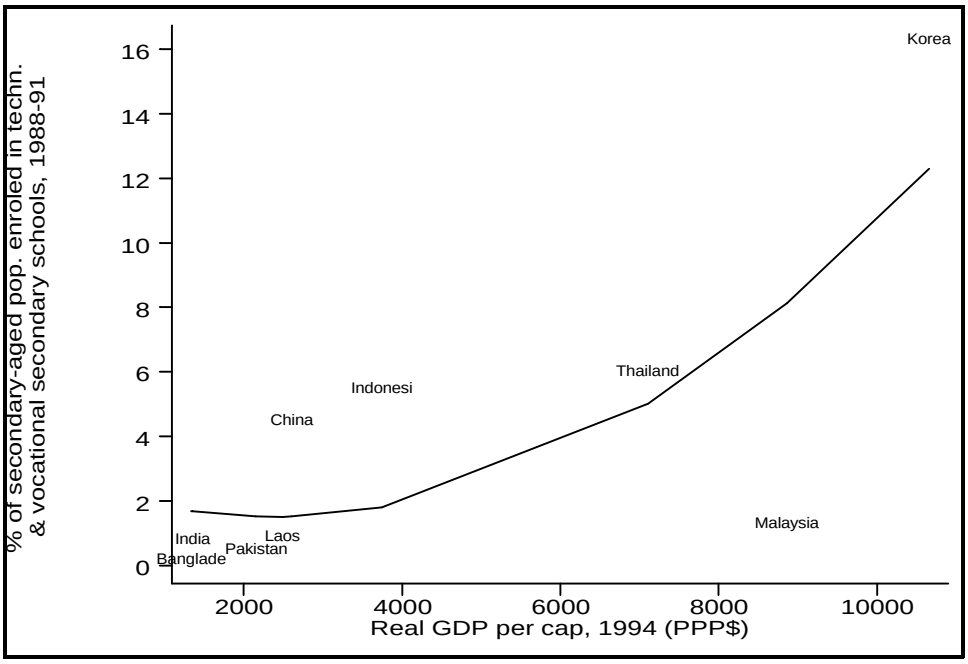

Figure 13: Enrollment in technical and vocational secondary schools (as % of total secondary-school age population), selected Asian countries, 1988-91
Source: UNDP, 1997

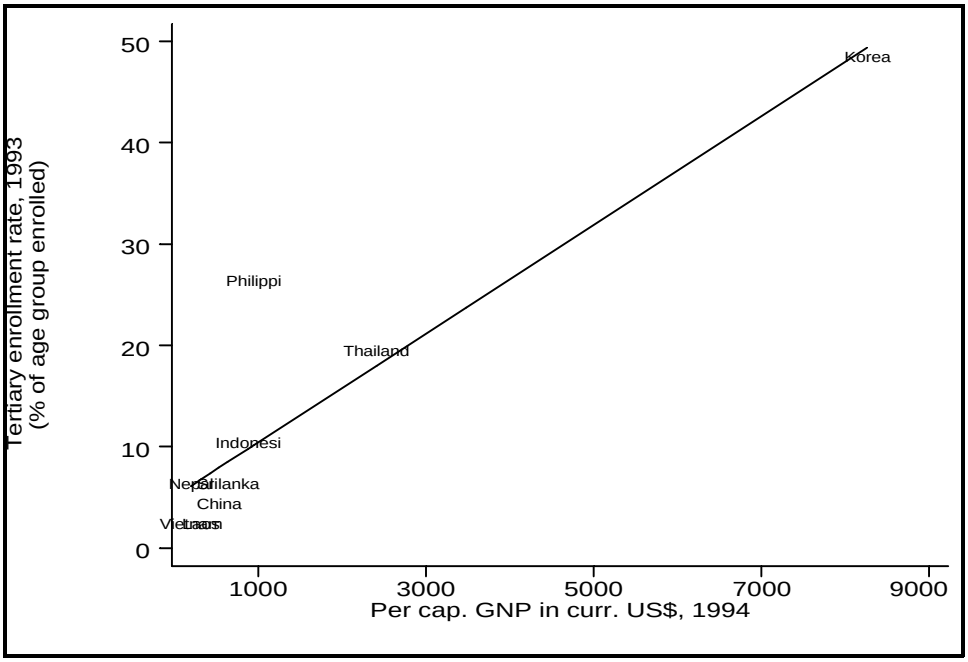

Figure 14: Gross enrollment rate at tertiary level, selected Asian countries, 1993
Source: World Bank, 1997

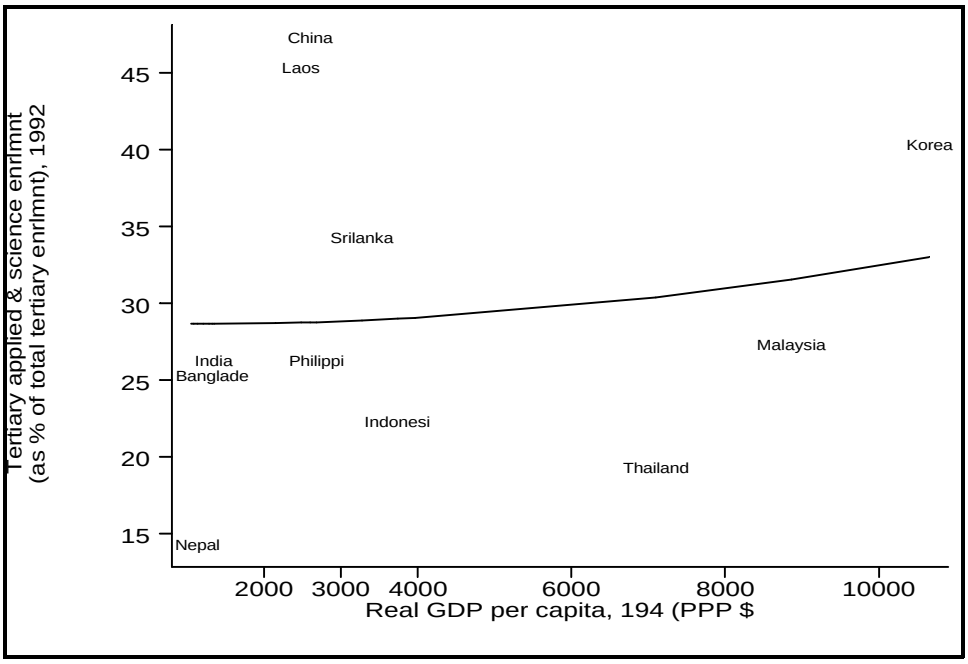

Figure 15: Tertiary applied and science enrollment (as % of total tertiary enrollment), selected Asian countries, 1992
Source: UNDP, 1997

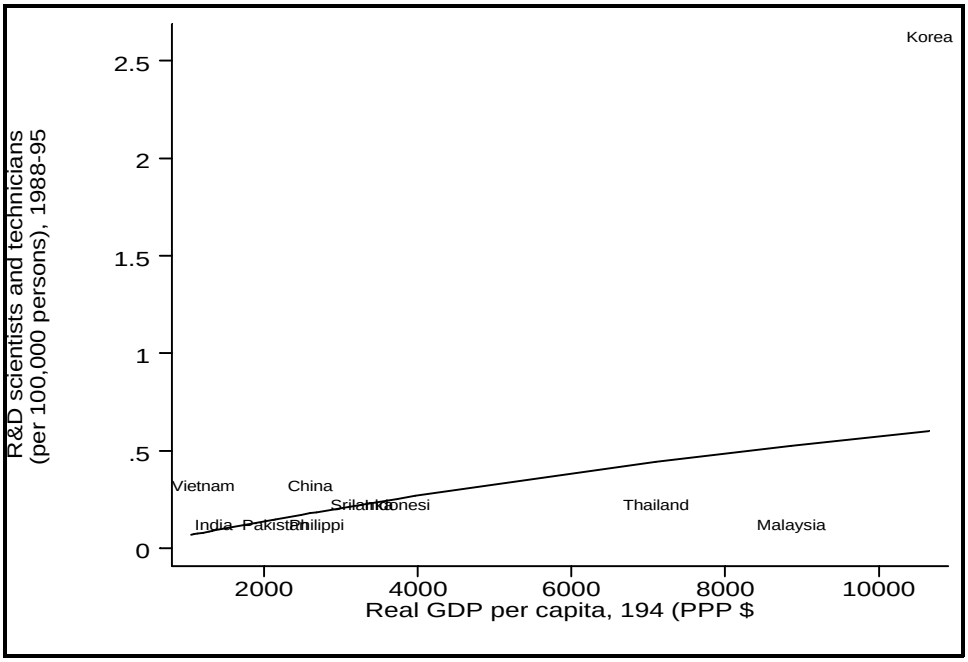

Figure 16: Number of R&D scientists and technicians per 100,000 population, selected Asian countries, 1988-95
Source: UNDP, 1997

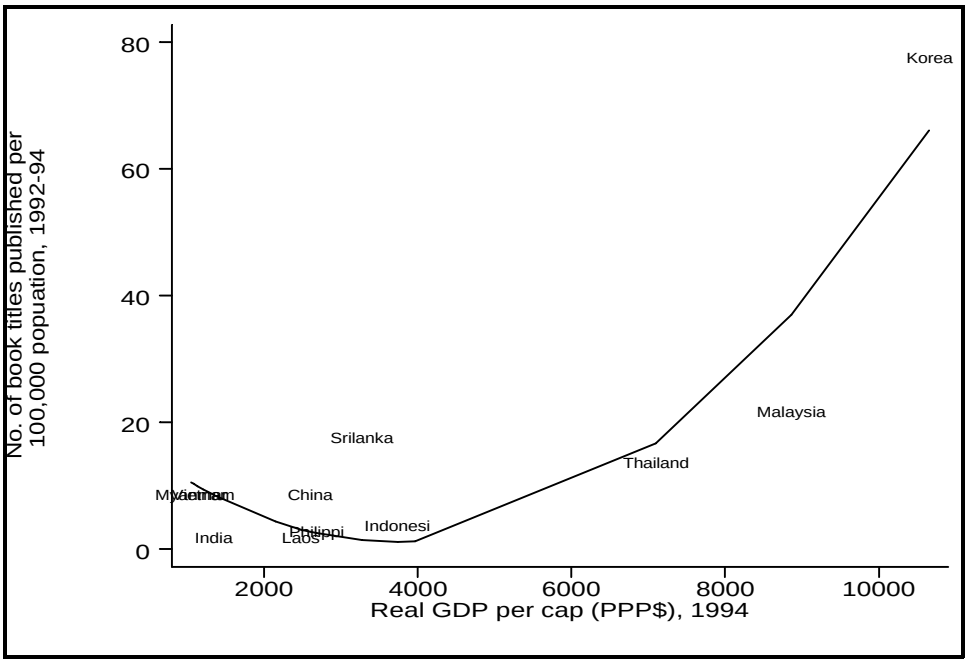

Figure 17: Number of book titles published per 100,000 population, selected Asian countries, 1992-94
Source: UNDP, 1997

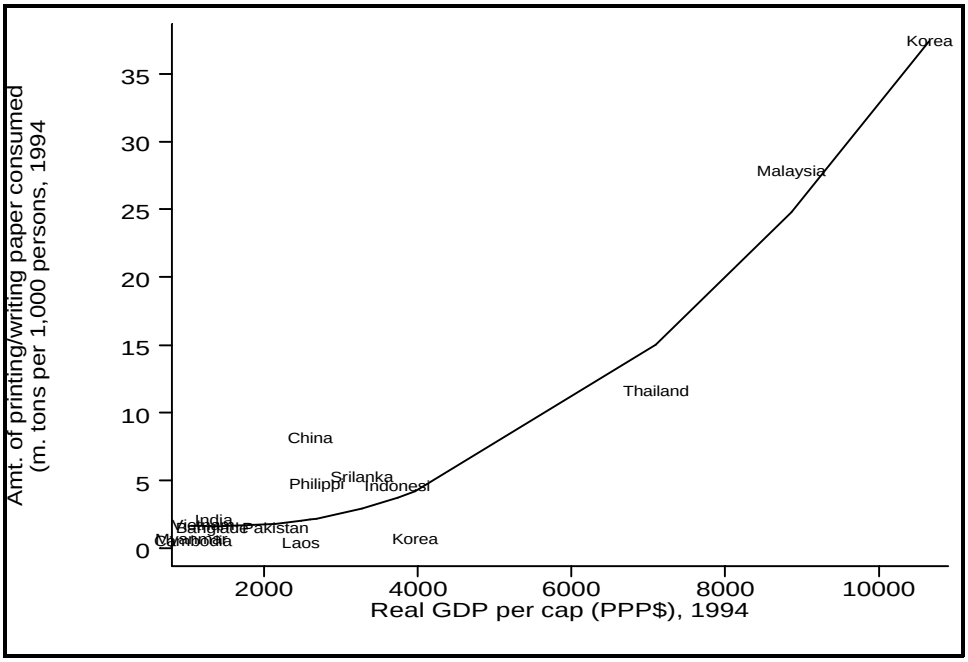

Figure 18: Amount of printing and writing paper consumed (metric tons per 1,000 population), selected Asian countries, 1994
Source: UNDP, 1997

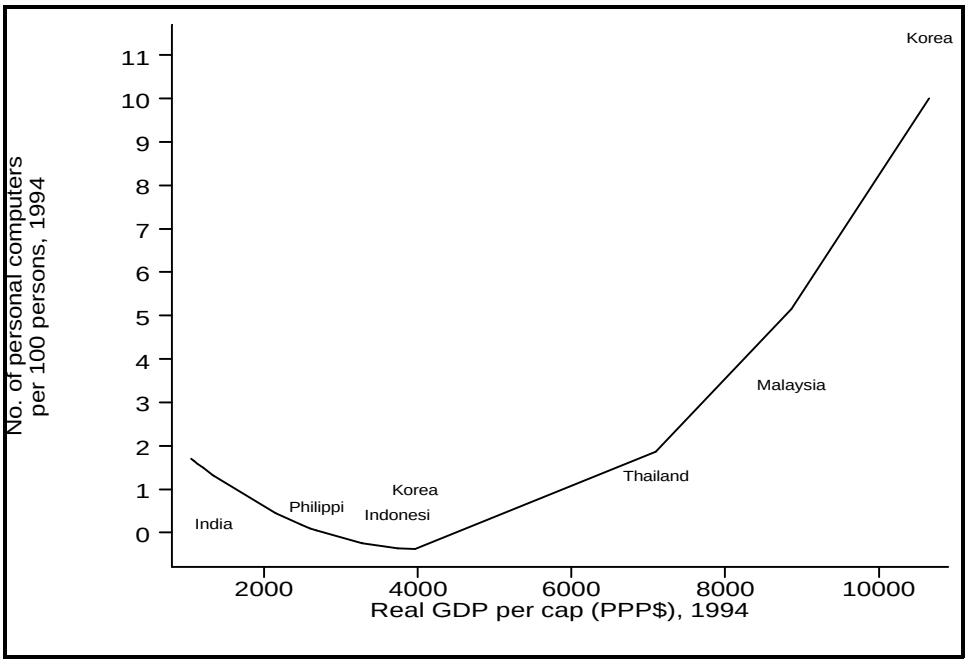

Figure 19: Number of personal computers in use per 100 persons, selected Asian countries, 1994
Source: UNDP, 1997

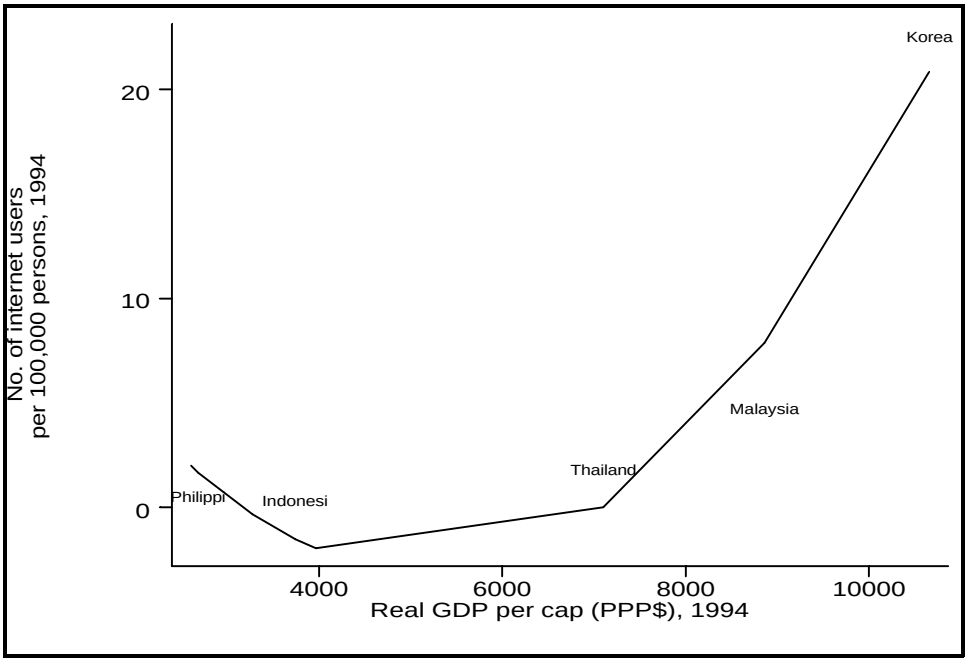

Figure 20: Number of Internet users per 100,000 population, selected Asian countries, 1994
Source: UNDP, 1997

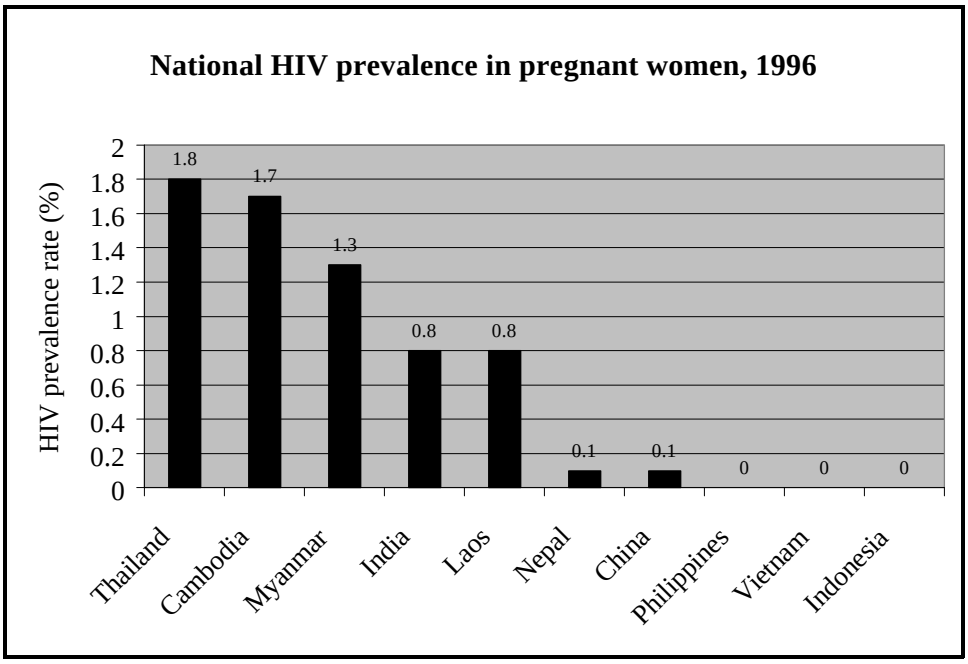

Figure 21: HIV prevalence among pregnant women, selected Asian countries, 1996
Source: Ministry of Health, Government of Cambodia, 1997.

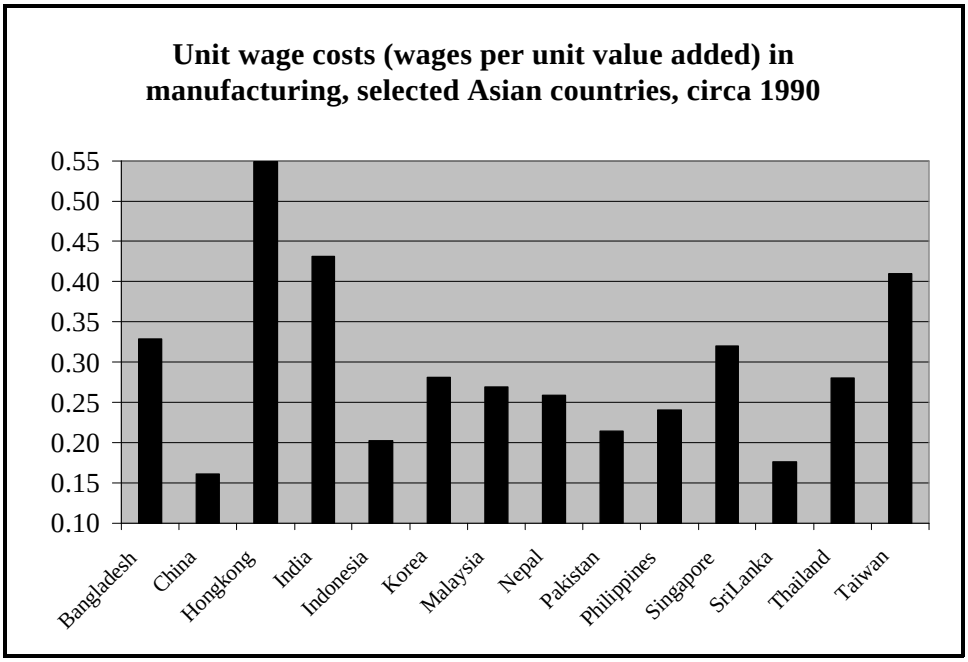

Figure 22: Unit labor costs (wages per unit value added) in the manufacturing sector of selected Asian countries, circa 1990
Source: UNIDO data base.

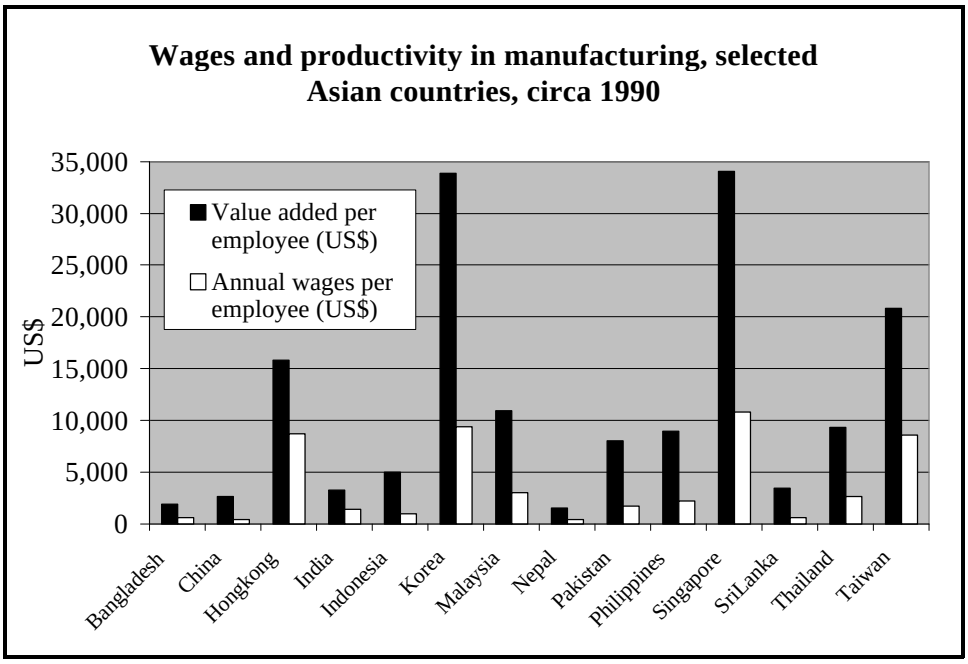

Figure 23: Wages and productivity in manufacturing, selected Asian countries, circa 1990
Source: UNIDO data base

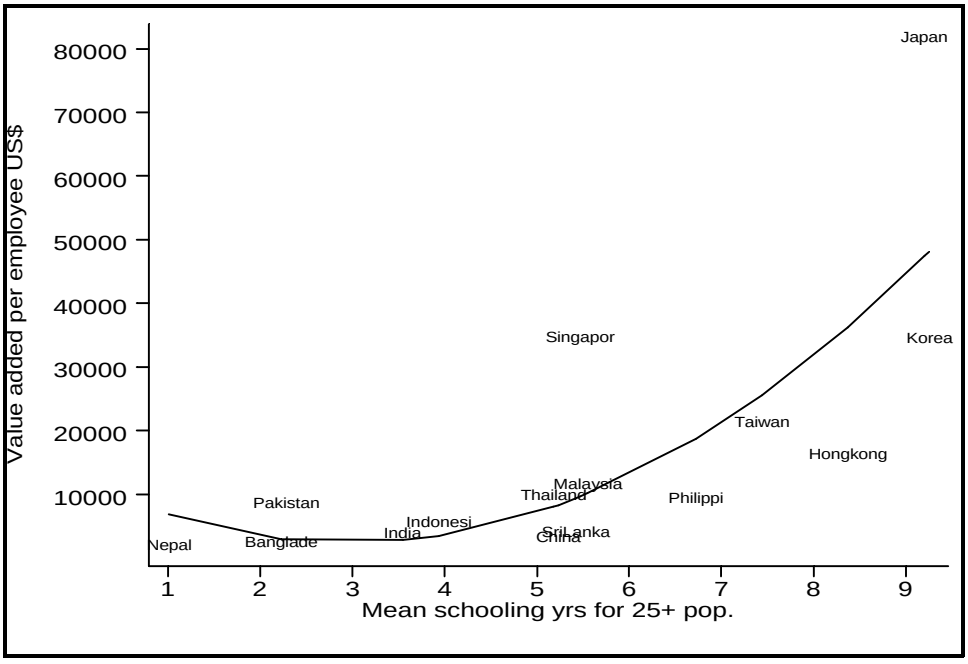

Figure 24: Labor productivity (i.e., value added per employee) in manufacturing and mean schooling attainment in the adult population, Asia, 1990
Source: UNIDO data base and Barro and Lee (1996).

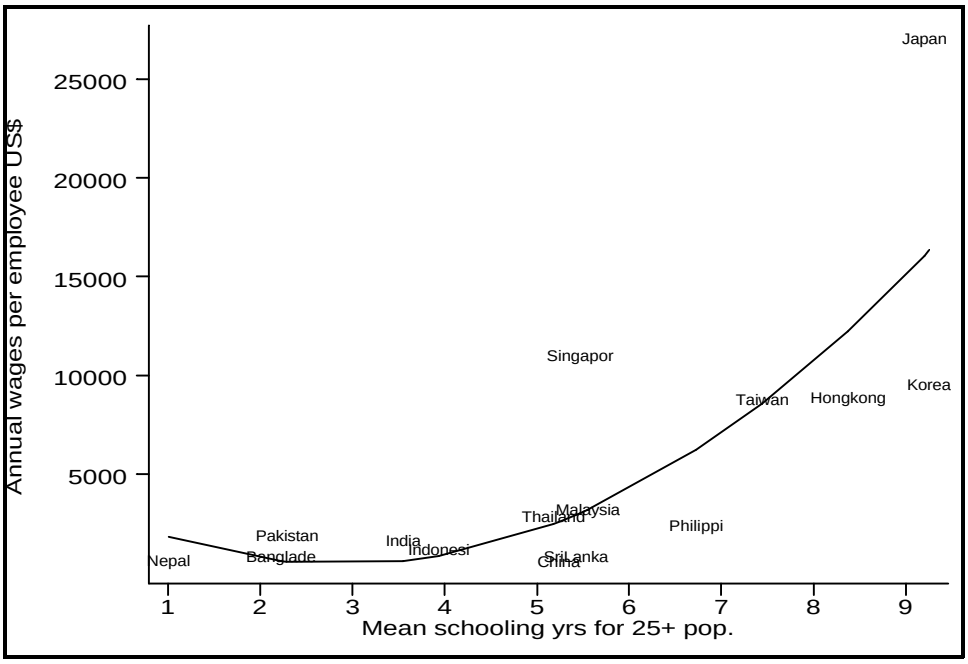

Figure 25: Annual wage rates (i.e., compensation per employee) in manufacturing and mean schooling attainment in the adult population, Asia, 1990
Source: UNIDO data base and Barro and Lee (1996).

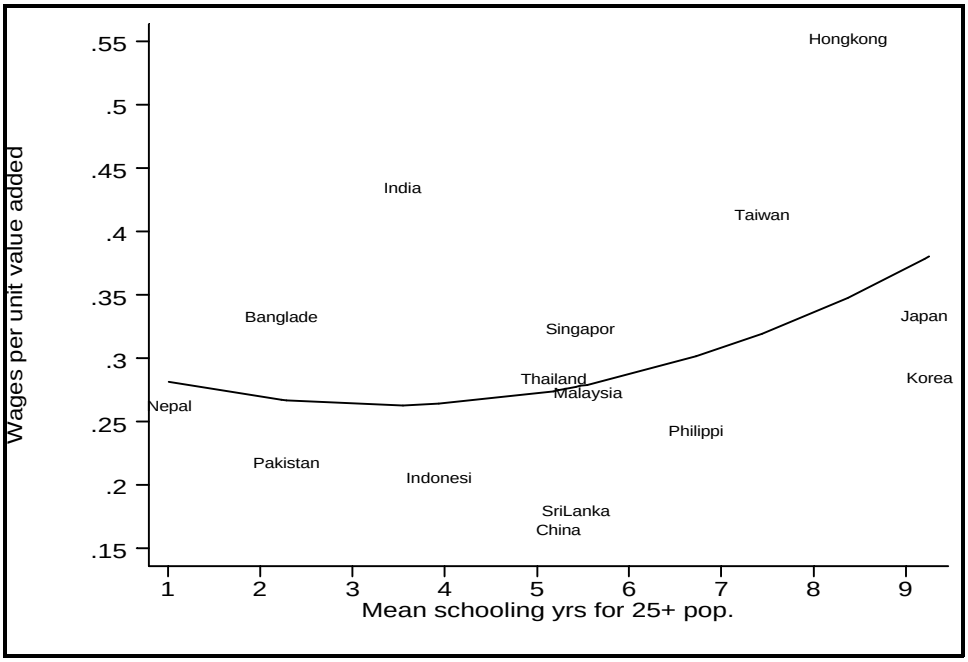

Figure 26: Unit labor costs (i.e., wages per unit value added) in manufacturing and mean schooling attainment in the adult population, Asia, 1990
Source: UNIDO data base and Barro and Lee (1996).

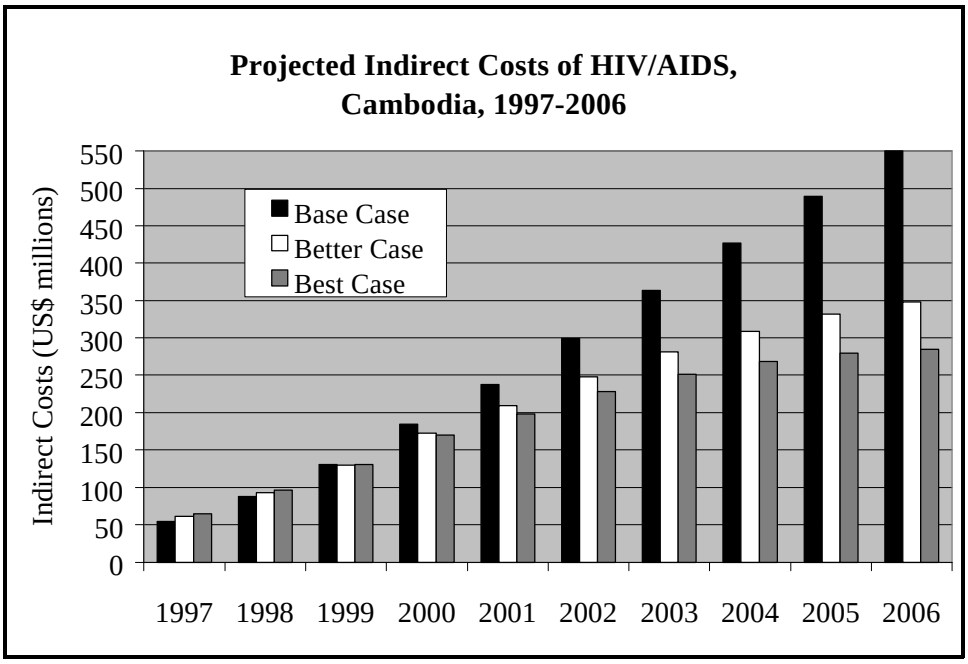

Figure 27: Project indirect costs of HIV/AIDS in Cambodia, 1997-2006
Source: Myers, Sotharith and Calabria, 1997.

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