

RATES OF RETURN TO EDUCATION IN ASIA: A REVIEW OF THE EVIDENCE

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Wendy Kenyon provided excellent research assistance in locating and analysing the original rates of return studies for Asian economies.

I. INTRODUCTION

In his most recent (1993) global update of returns to investment in education, George Psacharopoulos (GP) states that the "rates of return patterns established in earlier reviews are upheld" (see Psacharopoulos, 1993: abstract). The four most important patterns are:

1. The rates of return to education (henceforth ROREs) for all levels of education generally exceed the aggregate social opportunity cost of capital;
2. The private and social ROREs are highest for primary education and that "returns decline by level of schooling" (*ibid*);
3. The gap between private and social ROREs to higher education is usually considerably higher than the equivalent gaps for primary and secondary education;
4. The pattern of ROREs remains stable as countries develop with only relatively minor declines in ROREs over time. Thus, "investment in education continues to be a very attractive investment opportunity" (*ibid*).

The evidence for the existence of these four patterns is based mainly on aggregate social and private ROREs by level of education (primary, secondary and higher) for each of the main geographical regions (see Table 1). The pervasiveness of these patterns has now become the established orthodoxy in virtually all publications and discussions concerning investment priorities for education in developing countries. The World Bank's 1995 Education Sector Review relies very heavily on rates of return analysis and the findings of GP's global updates in support of three of its six major policy recommendations, namely that there should be higher priority to education, greater attention to outcomes, and public investment should be focused on basic education (see IBRD, 1995).

Table 1: Rates of return to investment in education by region and level of schooling

Region	Social			Private		
	P	S	H	P	S	H
Sub-Saharan Africa	24.3	18.2	11.2	41.3	26.6	27.8
Asia	19.9	13.3	11.7	39.0	18.9	19.9
Europe/Middle East/N.Africa	15.5	11.2	10.6	17.4	15.9	21.7
Latin America/Caribbean	17.9	12.8	12.3	26.2	16.8	19.7
OECD	n.a.	10.2	8.7	n.a.	12.4	12.3

Source: Psacharopoulos, 1993.

This is the second in a series of three articles that examine critically both the theoretical and empirical validity of these four patterns, and especially the pattern concerning social ROREs by level of education.¹ The first article reviewed all the African RORE country studies used by GP in the 1993 global update. It concluded that "the conventional RORE patterns almost certainly do not prevail in Sub-Saharan Africa under current labour market conditions. If any continent-wide patterns can be discerned, they are likely to be markedly different" (Bennell, 1994:18). This article analyses the RORE evidence for Asian countries.² While the quality of the data used in these studies is somewhat better than in SSA and all the reported ROREs are derived using the full-method,³ the central conclusion of this article is the same, namely that none of the above-mentioned patterns prevails in Asia.

The discussion will proceed as follows. Section II scrutinises the RORE estimates for Asian countries presented in the 1993 global update at their face value. Section III then deconstructs these estimates, looking in particular at the reporting from the original country studies, reliance on cross-sectional data, and sample selection and omitted variable biases. The final section presents an alternative set of adjusted ROREs.

II. THE 1993 GLOBAL UPDATE

Table 2 presents the social and private ROREs by the three main levels of education for Asian and Pacific countries as reported by GP in his latest 1993 global update. What is perhaps most striking about these data is that so few countries have a full set of private and social ROREs from which any patterns can be meaningfully discerned. Three other countries also have full sets of social RORE estimates, but have not been included in the global update (see below). But even so, this still leaves nine Asian countries that have no RORE estimates at all and another seven countries where these are incomplete.⁴ Just why so few RORE studies have been undertaken is a key issue but is beyond the remit of the present discussion. Suffice it to say that the reasons are likely to be related to both technical/intellectual and political/policy factors. The necessary cost and benefit data needed to derive robust full method RORE estimates are rarely available and their derivation usually requires high level analytical skills that are frequently in very short supply. Moreover, despite the World Bank's strong attachment to ROREs, governments themselves rarely rely on this type of analysis in deciding educational priorities (see Bennell, 1995).

Reliance on such limited data is bound to be problematic. This is especially the case when country estimates are so widely dispersed. For example, the RORE to primary education reported for Singapore was just 6.6 per cent in 1966 whereas for neighbouring Thailand this figure (just four years later) is nearly five times larger at 30.5 per cent. In fact, if median RORE values by level of education are used instead of means, there are no significant differences in social ROREs by level of education (see Table 2).

Table 2: Social and private ROREs by level of education as reported in the 1993 global update

Country	Study	Year	Social			Private		
			P	S	H	P	S	H
Hong Kong	Hung (1982)	1976	-	15.0	12.4	-	18.5	25.2
India	Tilak (1988)	1978	29.3	13.7	10.8	33.4	19.8	13.2
Indonesia	McMahon & Boediono (1992)	1989	-	11.0	5.0	-	-	-
Malaysia	Lee (1980)	1978	-	-	-	-	32.6	34.5
Nepal	USAID (1988)	1982	-	-	-	-	15.0	21.7
Pakistan	Hamdani(1977)	1975	13.0	9.0	8.0	20.0	11.0	27.0
Papua New Guinea	McGavin (1991)	1986	12.8	19.4	8.4	37.2	41.6	23.0
Philippines	Hossain & Psacharopoulos (1994)	1988	13.3	8.9	10.5	18.3	10.5	11.6
Singapore	Clark & Fong (1970)	1966	6.6	17.6	14.1	-	20.0	25.4
South Korea	Ryoo (1988)	1986	-	8.8	15.5	-	10.1	17.9
Sri Lanka	Sahn & Alderman (1988)	1981	-	-	-	-	12.6	16.1
Taiwan	Gannicott (1972)	1972	27.0	12.3	17.7	50.0	12.7	15.8
Thailand	Blaug (1971)	1970	30.5	13.0	11.0	56.0	14.5	14.0
Mean	All		18.9	12.9	12.5	35.8	18.2	20.5
	Complete Sets		18.9	13.4	11.5	35.8	18.4	17.4
Median	All		13.3	12.3	10.8	33.4	12.7	14.0
	Complete Sets		13.3	13.0	10.8	33.4	15.0	17.9

Source: Extracted from Table A-1 Psacharopoulos, 1993.

Notes: Countries shaded have full sets of social and/or private ROREs by level of education.

But even taken at their face value, it is clear that the Asian ROREs reported in the 1993 global update do not fully conform with the allegedly conventional RORE pattern. Certainly, the overall level of social ROREs appears to be higher than the social opportunity of capital, and the mean social ROREs are highest to primary education, followed by secondary and higher education. However, the private-social RORE differential for higher education is not the highest in any of the Asian countries (with the exception of Pakistan) and ROREs have fallen for at least one level of education in over half of the countries for which adequate comparative data are available (see Tables 3 and 4).

Table 3: Private-social ROR gaps by level of education in Asian countries

Country	P	S	H
India	4.1	6.1	2.4
Pakistan	7.0	2.0	19.0
Papua New Guinea	24.4	22.2	14.6
Philippines	5.0	1.6	1.1
Taiwan	23.0	0.4	- 1.9
Thailand	25.5	1.5	3.0

Source: See Table 1.

Notes: Shaded countries are where private-social RORE gaps for primary and/or secondary education are higher than corresponding gap for higher education.

III. DECONSTRUCTING THE GLOBAL UPDATE

(i) Reporting

There are basic reporting errors in two of the 13 Asian country studies used in the 1993 update - South Korea and Thailand. The study by Park (1976) for South Korea which was included in the 1985 update is also misreported.⁵ This is the only study for South Korea that has a full set of social ROREs by level of education and for this reason there are strong grounds for its continued inclusion in any update. The same is true of Hoerr's thorough study of ROREs in Malaysia. This was included in GP's first 1973 Review but inexplicably dropped thereafter. While this study is now very dated, other studies from the late 1960s and early 1970s are reported in the 1993 update (notably Singapore, Taiwan and Thailand).

Table 4: Change in ROREs by level of education over time in Asia

Country	Period	Social			Private		
		P	S	H	P	S	H
India	1965-1978	15.9	1.8	0.5	16.1	1.0	3.0
Pakistan	1975-1979				- 16.0	- 5.4	- 20.7
Papua New Guinea	1979-1986	- 7.1	5.5	7.4	7.8	24.0	11.6
Philippines	1971-1988	6.3	2.4	2.0	9.3	4.0	2.1
South Korea	1967-1986		- 0.2	10.0			-
Taiwan	1980-1982		- 6.0				
Thailand	1970-1985			2.5			7.9

Source: Extracted from Table A-9, Psacharopoulos, 1993.

Notes: Shaded countries are where ROREs have fallen for at least one level of education.

The Indonesian study by MacMahon and Boediono(1992) is based on earnings data from the late 1980s but does not have ROREs to primary education. However, Godfrey (1988) has calculated a full set of social and private ROREs for 1982 and 1986 (using the same survey sources as Boediono and MacMahon) as does GP himself for 1978 (see Psacharopoulos, 1984). Again, therefore, a strong case exists for the inclusion of the Godfrey estimates in any RORE update.

(ii) Cross-Sectional Data

Among the seven studies that have full sets of social ROREs by level of education, five utilise data from the 1960s and 1970s. Given that the supply and demand conditions shaping labour markets for all categories of educated personnel have changed dramatically in virtually all Asian countries during the last 15 years or so, this clearly calls into question the continued reliance on such old RORE estimates.

Broadly speaking, Asian economies can be divided into two groups. In the 'miracle', high performing Asian economies (Hong Kong, Singapore, South Korea, Taiwan, Thailand), demand for university educated individuals has been very dynamic. For South Korea, Ryoo et al have been able to calculate ROREs using the same data sources and methodology for the period 1974-1986 (see Table 5). They conclude that "in the Korean context of rapid industrial growth, the large expansion of secondary and college education for both men and women have made secondary schooling increasingly valuable as a means of access to higher, post-secondary education rather than an end in itself. Private (and social) rates (of return) at the

lower levels of schooling fell rapidly relative to those at higher levels" (see Ryoo et al, 1993:76). Similar trends are likely to have occurred in the other miracle countries.

Table 5 Private and social ROREs in South Korea by level of education over time.

Level of education		1974	1979	1986
Lower secondary	Private	5.65	4.86	2.81
	Social	6.42	5.61	2.49
Upper secondary	Private	13.54	9.78	6.76
	Social	17.17	10.75	8.81
University	Private	9.04	11.82	10.77
	Social	15.42	13.86	11.23

Source: Ryoo et al, 1993.

In marked contrast, in the second group of Asian economies (which includes India, Pakistan, Philippines and Sri Lanka) educated labour markets are characterised by generalised over-supply. Consequently, both private and social ROREs are likely to have fallen as university graduates and school leavers have 'filtered down' into lower paying occupations. In all probability, these falls are likely to have been greatest for the least educated groups of workers.

In fact, the global update does not identify any systematic declines in ROREs over time. However, this is partly because unadjusted ROREs for the earlier years are being compared with adjusted ROREs, which are generally considerably lower. India is an example, where the heavily adjusted estimates for 1965 are compared with unadjusted estimates for 1978. If, instead, the adjusted estimates for 1978 are used, then social ROREs show a marked decline for all three education levels.

(iii) Sample Selection Bias

In order to derive robust RORE country estimates, earnings and output data must be collected for a large, representative sample of the entire population across all economic sectors and geographical locations. Table 6 shows, however, that only the Indonesia and Philippine country studies are able to draw upon relatively large national household surveys. The Pakistan and India studies also use household survey data, but this is limited to very specific locations - one city (Rawalpindi and males only) and one predominantly rural district in Andhra Pradesh with fewer than 1000 respondents (see Hamdani, 1977 and Tilak, 1988). In

the case of India, earlier RORE studies are available that are based on national survey data but in the 1993 update GP relies on the very limited and probably biased RORE estimates from the Tilak study.

The remaining studies (Papua New Guinea, Singapore, South Korea, Thailand) rely exclusively on formal sector earnings. Since earnings from wage employment are generally higher than from self-employment, in countries where the self-employed comprise a large proportion of the working population, particularly among those with only basic education, ROREs to primary education and, to a lesser extent, secondary education are likely to be seriously over-estimated.⁶ This source of bias is recognised by most of the authors of the country studies. For example, Mark Blaug comments in his study of Thailand that "our earnings figures are only for Greater Bangkok and not for the whole Kingdom; while this creates little bias for the secondary and higher educated categories, since most of these live and work in Greater Bangkok, it is extremely doubtful that primary educated farmers earn as much as do primary educated workers in Greater Bangkok. This throws doubt on our principal result, namely, the higher rates to primary as against secondary and tertiary education" (Blaug, 1971:15). In a similar vein, McGavin argues that "most Papua New Guineans still live in a traditional society where the chief economic link is through cash cropping rather than wage employment. The appropriateness of the use of earnings for a minority engaged in wage employment may be questioned where minimum wages are not scarcity valuations" (McGavin, 1991:217).

(iv) Income Adjustments

Individual incomes differ not only as a result of differences in education investments but also as a consequence of a variety of other personal and work-related factors. Most important among these are natural ability, socio-economic background, labour force status, type of employer and economic sector. GP heavily discounts the significance of these factors as determinants of individual incomes and, wherever possible, relies on ROREs that are calculated from unadjusted incomes.

Table 6 shows the income adjustments made in the Asian country studies. What is particularly noticeable is the large variations in these adjustments, with some studies making no adjustments whatsoever (most notably Philippines and PNG), while others include most of the key adjustment factors (in particular Tilak's study for India). However, most studies explicitly mention the importance of adjustments in influencing RORE estimates. Blaug states, for example, that "we failed to produce any measure of native ability or achievement drive and it is perfectly conceivable that the inclusion of such a variable in our model would have generated quite different age-earnings profiles and hence quite different rates of return" (op.cit:15). In

Table 6: Cost and income adjustments made to social ROREs in Asian country studies

Country	Year Data	Sample	Overall data quality	Adjustments
Hong Kong	NA	NA	NA	NA
India	1978	2% sample West Godavari District, Andra Pradesh	Good	W, LE, A, UE, LFP
Indonesia	1989	National, large	Very good	G, R, S, U/R, W
Pakistan	1975	One city, 1000 households, males	Poor	NEI, UFM, LE
Papua New Guinea	1986	Formal, private urban sector only	Good	None
Philippines	1988	4283 households Household survey	Good	None
Singapore	1966	Sample household survey full time wage earners	Good	UE, LFP, LE
South Korea	1986	Private: Enterprises with 10+ employees	Good	?
Taiwan	1972	NA	NA	NA
Thailand	1970	Greater Bangkok 5000 households	Good	G, SEB, S, W

Notes:

A = ability; G = gender; LE = life expectancy/mortality; LFP = labour force participation; NEI = non-earnings income; R = region; S = sector; UE = unemployment; UFM = unpaid family members; U/R = urban/rural; W = school wastage.

Malaysia, "unadjusted rates grossly over-estimate the true rates because individuals differing in education also differ in many other characteristics that cause their incomes to differ systematically" (Lee:1980:155).

The lack of consistency with respect to both cost and adjustment factors seriously undermines the comparability of the Asian studies and thus the entire (regional) aggregation process. Equally problematic, unadjusted estimates are likely to overestimate all ROREs but particularly those at lower levels of education where natural ability tends to be a more important factor. As usual, data are limited but for the four Asian countries where unadjusted-adjusted comparisons can be made, it can be observed in Table 7 that the absolute fall in social ROREs is greatest for primary followed by secondary education. The same is also true in Sub-Saharan Africa (see Bennell, 1996).

Table 7: Unadjusted and adjusted social ROREs by level of education

Country	Study	Unadjusted			Adjusted			
		P	S	H	P	S	H	
India	Tilak (1988)	M	27.5	16.8	10.8	8.5	-ve	7.0
		F	18.7	11.7	9.5	-ve	-ve	2.8
Pakistan	Hamdani (1977)		14.0	10.0	9.0	10.0	8.0	7.0
Philippines	ILO (1974)		7.0	6.5	8.5	5.0	6.0	7.5
Thailand	Sethasathien (1977)		87.5	45.1	22.0	34.3	18.5	11.4

(v) Cost Adjustments

The large majority of Asian country studies assume that the opportunity costs of education during all or the greater part of primary schooling are zero or close to zero. For India and Pakistan it is assumed that children do not enter the workforce until the age of eight. However, as Hamdani points out, in Pakistan "the returns to primary education are sensitive to alternate assumptions of the commencement of opportunity costs" (Hamdani, 1977:157). Taking into account "at-home productivity" from the age of five onwards almost halves the social RORE to primary education- from 13.0 per cent to just 7.0 per cent. Similarly in PNG, McGavin emphasises "the considerable sensitivity of estimates of returns to schooling to variations in assumptions about the "working life" of children and young adults in full time education" (op.cit:216). In their study of ROREs in the Philippines, Tan and Paqueo make a very marginal adjustment to the opportunity costs of primary education, which nevertheless reduces the social RORE from 18.2 per cent to 12.2 per cent (see Tan and Paqueo, 1989).⁷

The growing body of research on gender and education highlights the importance of children's labour (and that of girls' in particular) for household production and reproduction activities (see Herz et al, 1991; King and Hill, 1993). Under-valuing this contribution runs the serious risk, therefore, of correspondingly over-estimating ROREs to all levels of education but especially primary education. Correctly adjusting for this factor alone is likely to alter quite dramatically the conventional RORE pattern.

Table 8: Adjusted, full-set social and private ROREs by level of education for selected Asian countries

Country	Study		Social				Private			
			P	LS	US	U	P	LS	US	U
India	Tilak (1988)	M	8.5	-ve	2.4	7.0	9.9	-ve	3.2	7.0
		F	-ve	-ve	0.4	2.8	1.7	-ve	0.7	3.2
Indonesia	Godfrey (1988)	M	10.0	19.0	19.0	9.0				
		F	14.0	25.0	22.0	10.0				
Malaysia	Hoerr (1970)		8.2	15.3	12.8	5.8	12.9	18.9	15.6	11.4
Pakistan	Hamdani (1977)		7.0	(9.0)		8.0	9.0	(11.0)		27.0
PNG	McGavin (1991)		12.8	19.4	11.1	8.4	37.2	41.6	37.6	23.0
Philippines	Tan & Paqueo (1989)		9.5	9.3	12.9	13.3	12.2	10.2	13.8	14.0
Singapore	Clark & Fong (1970)	M	9.4	11.9	18.2	15.4	-	16.3	21.0	25.5
		F	3.8	11.7	17.0	13.7	-	16.0	19.0	25.3
South Korea	Park (1976)		15.5	14.4	12.2	8.8	22.8	15.3	12.4	9.9
Taiwan	Gannicott (1972)		27.0	(12.3)		17.7	50.0	(12.7)		15.8
Thailand	Blaug (1971)		17.0	(10.0)		7.0	27.0	(11.0)		11.0

Note: Shaded countries are where the social RORE to primary education is significantly higher (i.e. more than two percentage points) than secondary and/or higher education.

While opportunity cost assumptions result in an over-estimation of ROREs to primary education, assumptions commonly made about the opportunity costs of higher education are likely to under-estimate ROREs. In most studies, the opportunity costs of higher education are assumed to be the average wage income of upper secondary school leavers in the 18-25 age cohort. This is frequently not adjusted (downward) for unemployment, despite the fact that genuine open unemployment is concentrated among secondary school leavers in most developing countries (see Turnham, 1993). If unemployment among this group is sufficiently high, then it is quite possible that the opportunity costs of higher education are effectively zero (see Bennell, 1995). Significantly reducing or even eliminating opportunity costs to

higher education has a dramatic (upward) effect on social ROREs because these costs typically comprise between one-half and two-thirds of total education investment costs.

IV. AN ALTERNATIVE UPDATE

An alternative set of social and private ROREs in Asian countries is presented in Table 8 which uses, wherever possible, adjusted ROREs, on the grounds that these are more accurate indicators of the actual contribution of education to individual incomes. Three other studies excluded from the GP global update have also been included (Malaysia (Hoerr), South Korea (Park) and Indonesia (Godfrey)) because they are of an equal or higher quality than the other Asian studies drawn upon by GP and have social ROREs for all three levels of education.

None of the 'conventional' rates of return patterns can be discerned from this alternative set of adjusted RORE estimates. More specifically:

(i) Over half the social ROREs by level of education are below the social opportunity cost of capital, conservatively assumed to be 10 per cent.⁸ Primary education is not even socially profitable in six out of the nine Asian countries listed in Table 8.⁹ As expected, social ROREs are particularly low in countries such as India, Pakistan and the Philippines where educated labour is in excess supply and in all countries (except Taiwan where we have been unable to scrutinise the data and methodology), at least one level of education has a social RORE that is 10 per cent or below.

(ii) The social RORE to primary education is significantly higher than the corresponding ROREs to secondary and/or higher education in only two countries (Taiwan and Thailand).

(iii) The private-social RORE gap is higher for primary education than the equivalent gaps for one or both of the other two educational levels in all eight countries for which data are available with the single exception of Pakistan (see Table 9).

(iv) Social ROREs have fallen for at least one level of education in all countries except the Philippines and Thailand.

Interestingly, among the original studies themselves, there is no uniformity in recommendations concerning education investment priorities. Only three studies (Papua New Guinea, Philippines and Thailand) come to firm policy conclusions in favour of primary education. The authors of the Pakistan study concluded that "the differences in the social returns are too narrow to recommend resource allocations towards any particular education level" (Hamdani, 1977:158). The Singapore study argued strongly that "secondary education is the most profitable from a societal point of view, followed by university education,

followed by primary education (Clarke and Fong, 1966). Similarly, "the most efficient and equitable growth strategy in Indonesia involves increased investment in junior secondary general education at the highest percentage rate" (McMahon and Boediono, 1992:149).

Table 9: Private-social (adjusted) RORE gaps by level of education in selected Asian countries

Country		P	LS	US	U
India	M	1.1	NA	0.8	0.0
	F	NA	NA	0.3	0.4
Malaysia		4.7	3.6	2.8	5.6
Pakistan		2.0	(2.0)		19.0
PNG		24.4	22.2	26.5	14.6
Philippines		2.7	0.9	0.9	0.7
Singapore	M	-	4.4	2.8	10.1
	F	-	4.3	2.0	11.6
South Korea		7.3	0.9	0.2	1.1
Taiwan		23.0	(0.4)		-1.9
Thailand		10.0	(1.0)		4.0

Note: Shaded countries are where the private-social RORE gap for primary education is greater than equivalent gaps for secondary and/or higher education.

In conclusion, therefore, a detailed analysis of the RORE studies undertaken in Asian countries reveals quite unambiguously that no convincing case can be made for the existence of any uniform pattern of ROREs with respect to the overall size of ROREs, ROREs by level of education, the subsidisation of education, and changes in ROREs over time.

ENDNOTES

1. The third and final article will examine the RORE evidence from South American and Caribbean studies.
2. The IBRD classification of economies by region has been used for this analysis. Thus "Asia" includes the developing countries of the Pacific but excludes the Middle East.
3. ROREs can be derived using one of three basic methodologies. When individual earnings data are available (usually from Labour Force or Household Surveys or Population Censuses) to construct age-earnings profiles for each level of education, the standard internal rates of return equation can be used. The internal rate of return for a particular education or training investment is that rate of return that equalises the present value of expected benefits with the present value of costs or alternatively the rate of interest at which the difference between discounted benefits and costs is zero.

$$\sum_{t=0}^{t=n} \frac{Bt}{(1+r)^t} = \sum_{t=-p}^{t=0} \frac{C^t}{(1+r)^t}$$

where n is the number of years of post-education working life; and p is the number of years of education.

The short cut method is employed when the only earnings data available are average incomes by level of education. RORs are derived using the following equation:

$$r_s = w_s - w_{s-1}/t_s(c_s + w_{s-1})$$

where r_s is the rate of return to educational level s over education level s-1 as the control group; w_s and w_{s-1} are the mean annual salaries of graduates with s and s-1 level of education, respectively; c is the annual cost of per student of educational level s, and t_s is the number of years for educational level s. It is argued that this method gives reasonably accurate ROREs when the post-education period is relatively long (at least thirty years) and where the pre- and post-education differentials remain relatively constant over time (see Psacharopoulos, 1982).

The basic Mincerian earnings function method takes the following form.

$$\ln y = b_0 + b_1s + b_2e + b_3e^2$$

where y is individual income; s is years of schooling; and e is years of work experience.

The extended earnings function method is used to estimate RORs by level of education by converting the continuous years of schooling variable into a series of dummy variables for each educational level. Additional independent variables such as ability, socio-economic background, and work characteristics can also be included in the earnings function.

4. This does not include the 12 island states of the Pacific and Macao none of which have RORE estimates.

5. The corrected ROREs for Thailand and South Korea (Park) are presented in Table 8. The original social RORE estimates presented in the South Korea study by Ryoo (1988) are as follows: lower secondary, males 2.5 females -2.7; upper secondary males 8.8, females 7.2; higher, males 11.2, females 11.8. The ROREs reported in the 1993 update are also seriously under-reported for Singapore (see Table 8).

6. Repeated reference is made in the literature to the Jamison and Lau (1982) study on farmer education and farmer efficiency. However, the one-off impact of lower primary education (ie. four years of education) on agricultural productivity is, in aggregate terms, only 8.0 per cent.

7. They assume that the youngest pupils in primary school forgo earnings equivalent to 10 per cent of the earnings of 19 year olds.

8. In the high performing Asian economies, the social opportunity cost of capital has probably been considerably higher than 10 per cent. Jeong, for example, argues that in South Korea during the 1970s "since the average rates of return on investment in physical capital are believed to be about 20 per cent, rates of return for all levels of education are lower than those for physical capital. This means that there has been an over-investment in human capital relative to physical capital" (Jeong, 1974:47).

9. Clearly, conventional social ROREs do not take into account the usually very sizeable positive externalities arising from educational investments.

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