A Comparative Study of Rates of Return to Education in Less Developed Nations*

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I. Introduction

Rate of return analysis has been widely applied for purposes of analyzing resource allocation to and within the education sectors of particular countries. A few economists have dealt with the problem of comparing rate of return results between various countries (Bowles [4], Carnoy [9], Hansen [15], and Psacharopoulos [23]), but their work fails to develop a completely satisfactory method for international comparison. The problem with making these comparisons results from the numerous variations on the rate of return methodology which are found amongst the individual researchers who have made the original rate of return estimates. This paper attempts first to develop a more satisfactory foundation for comparing rates of return to education amongst various countries, and second to evaluate the relative desirability of allocating resources amongst the three levels of education in eighteen partially developed and less developed nations. Finally, the paper estimates rates of return to the entire educational sector in each of the eighteen countries, and observes the relationship between these rates and the levels of per capita income.

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II. The *SMP*'s of Education in Eighteen Countries

The particular rate of return calculation adopted in this work for purposes of international comparison is the Social Marginal Productivity(*SMP*) of human capital. Each level of education is viewed as a unique type of human capital formation, and *SMP*'s are estimated for increments of each of three types of human capital (primary, secondary, and college educated workers). The eighteen countries for which estimates of the *SMP*'s of education are made include those partially developed and less developed countries for which the necessary data are available.

The data essential for calculating *SMP*'s of human capital formed via education include estimates of all costs of an educational level and estimates of the lifetime social benefits derived from the human capital. Of course, social benefits are defined as a worker's net additions to social product which are conventionally measured as the discounted average life time income differentials between a worker embodying a particular level of education and a worker embodying the next lower level of education. Thus, it is necessary to estimate lifetime age-earnings profiles for each of four types of labor (including illiterate workers as a basis for comparison with primary educated workers) in the sample of eighteen countries. The chief principle which guides the process of assembling all the data for this project is the objective of achieving results that are internationally comparable.

The data for operating cost are compiled from the UNESCO Statistical Yearbook [29]. Opportunity costs (income foregone by students while in school) are generated from the age-earnings profiles described below. Data on the cost of physical capital used in the education sector (rental cost of building and equipment) are estimated from the data on operating cost, using Edding's rule of thumb [13] that capital costs approximately equal twenty percent of operating costs. This procedure is subject to the criticism that variations in this ratio occur not only between countries, but also between the three levels of education. The procedure is utilized only after an alternative procedure failed to generate reasonably stable estimates of these costs. The alternative is based upon UNESCO data for aggregate capital expenditures on educational facilities and is judged superior in conceptual terms. However, the variations in the cost estimates were too

exaggerated to be acceptable.

Age-earnings profiles have been estimated for the various types of labor (classified on the basis of the level of education completed) in eighteen countries. The sources of the disaggregated income data, upon which these profiles are based, are the articles and books in which various researchers have made independent estimates of the rates of return to education in these countries.(1) The social benefits of the various levels of education have been estimated as the discounted differentials of the lifetime income streams. This procedure incorporates the assumption that before-tax income differentials are a suitable proxy measure of the differential contributions of the various types of labor to social product, or in other words, that labor is paid a wage equal to its marginal product.

A *SMP* for a particular level of education is defined by the following equation:

$$(1)\quad SMP=\frac{\sum_{i=1}^{t}(B_i/[1+d]^i)}{\sum_{j=1}^{n}(O_j/[1+d]^j+K_j/[1+d]^j+Y/[1+d]^j)}$$

where, B=net benefits to the particular level of education,
O=operating costs of the level of education,
K=educational capital costs of the level of education,
Y=income foregone by students (opportunity costs),
d=the social rate of discount,
t=number of years in the period from the time when a worker begins the level of education until he reaches age 65, and
n=number of years in the educational level.

The *SMP*'s for the three levels of education in the 18 countries are presented in Table 1.(2)

(1) The eighteen countries and the corresponding sources of income data are as follows: Brazil: Hewlett [17], Chile: Bruton [8], Colombia: Selowsky]24], Greece: Leibenstein [20], India: Blaug *et. al.* [3], Israel: Klinov-Malul [19], Kenya: Thias and Carnoy [28], Korea: Kim [27], Malaysia: Hoerr [18], Mexico: Carnoy [11], Nigeria: Bowles [5], Pakistan: Hadley[14], Philippines: Devoretz [12], Puerto Rico: Carnoy [10], Thailand: Blaug [2], Uganda: Smyth and Bennett [26], Venezuela: Shoup [25], and Zambia: Baldwin [1].

(2) For a more detailed discussion of the procedures used in estimating these *SMP*'s and a more extensive presentation of the data and the sources of those data, see Hadley [14, chapters 4 and 6].

The discount rates used for the calculation of these *SMP*'s were selected on the principle that the social rate of time preference in less developed countries is not extremely low or high. High rates of time preference (low rate of discount) are unlikely since per capita income is so low. Yet extremely low rates of time preference would indicate that there is little social consciousness of the need for economic development. While, indeed, individuals may choose present goods over future goods in a manner indicative of a very low rate of time preference, it is assumed that the government's behavior will reflect to some degree the need for economic deveopment, and thus partially offset the market actions of the private sector. Therefore, rates of 7, 10, and 15 percent are chosen since it is felt that they represent a moderate range of social time preference, and since they also allow for some analysis of the sensitivity of the *SMP*'s to changes in the discount rate. Casual observation suggests that in fact the *SMP*'s are quite sensitive to the choice of a discount rate. As expected, the larger *SMP*'s are those estimated with lower rates of discount, since the benefits associated with human capital extend over a relatively long period of time (the student's lifetime). However, the choice of a discount rate does not affect the relative rankings of the *SMP*'s of the various levels of education since the time span of costs and benefits is nearly identical for all three types of human capital. Nonetheless, the choice of a discount rate would be extremely crucial if these *SMP*'s were compared to *SMP*'s of alternative investments in physical capital since the time span of costs and benefits is typically dissimilar in these two cases.

Since the primary objective of estimating these *SMP*'s is consistency on an inter-country basis, it is important to consider briefly the procedures introduced in the attempt to achieve this objective. First, there is the problem of the comparability of the *SMP*'s with respect to time, since the income data are drawn from various points in time between 1957 and 1970, while the cost data are drawn from the time period 1966—1968. Thus, the age-earnings profiles are adjusted for economic growth and inflation such that they are stated in terms of the 1966—1968 value of the national currencies. These adjustments are based upon the assumption that the growth of all worker's earnings exactly keeps pace with the rate of inflation and the rate of economic growth.

Table 1. The social marginal productivities of primary, secondary, and college education in eighteen less developed countries using social discount rates of 7, 10, and 15 percent.

Country	Primary Level (7%)	Secondary Level (7%)	Higher Level (7%)	Primary Level (10%)	Secondary Level (10%)	Higher Level (10%)	Primary Level (15%)	Secondary Level (15%)	Higher Level (15%)
Brazil	12.18	2.48	3.58	5.97	1.44	2.16	2.51	0.68	1.06
Chile	17.16	2.58	1.71	9.92	1.62	1.18	5.14	0.90	0.72
Colombia	36.26	10.04	1.59	19.81	5.87	0.95	8.89	2.87	0.52
Greece	5.98	0.59	2.32	3.01	0.25	1.49	1.26	0.06	0.83
India	42.51	4.52	2.10	20.81	2.67	1.27	7.03	1.35	0.64
Israel	1.92	0.86	0.74	0.97	0.54	0.46	0.37	0.29	0.22
Kenya	10.41	6.83	3.62	5.25	4.08	2.45	2.31	2.11	1.48
Korea, Rep. of	8.65	1.22	2.41	5.45	0.79	1.63	3.04	0.45	0.91
Malaysia	10.07	4.59	2.27	6.46	2.81	1.49	3.67	1.49	0.86
Mexico	24.23	5.93	5.98	12.35	3.25	3.68	5.21	1.52	1.96
Nigeria	20.87	3.58	6.38	12.31	2.21	4.19	6.40	1.19	2.43
Pakistan	39.81	3.59	5.86	25.03	2.34	3.67	14.19	1.37	1.97
Philippines	21.77	5.20	1.73	11.26	3.39	1.18	5.08	2.00	0.70
Puerto Rico	4.59	3.66	a	2.22	2.15	—	0.77	1.07	—
Thailand	17.36	5.09	2.41	7.98	2.90	1.40	2.54	1.34	0.71
Uganda	18.44	6.59	2.49	11.22	4.22	1.73	6.00	2.38	1.09
Venezuela	16.85	3.08	4.50	10.82	2.03	3.05	6.14	1.19	1.84
Zambia	0.18	0.27	b	0.07	0.17	—	0.03	0.10	—

[a] Income data for college graduates in Puerto Rico were unavailable, and therefore, the SMP of higher education has not been estimated.

[b] There was no significant expenditure for higher education as of the date (1960) for which the income data are available in Zambia.

Other adjustments, which are sometimes introduced into estimates of rates of return to education, have been avoided in this work. These typically include adjustments for native intellectual ability, social class, the contingencies of unemployment and early mortality, and the likely growth of a worker's income over his lifetime which cannot be measured accurately by cross-sectional earnings profiles. However, in the opinion of this author, it is unlikely that the execution of such adjustments would improve either the accuracy or comparability of the rates of return estimated in this work since there are conceptual and operational problems involved with these adjustments, not to mention the lack of consistent data for all eighteen countries.[3] External benefits associated with education have also been om-

(3) For an elaboration on this argument, see Hadley [14, chapter 4].

itted from these calculations because to date, no adequate methodology has been developed for the measurement of these benefits.

A final point of methodology involves the treatment of opportunity costs. These are included in the estimates of the *SMP*'s of secondary and college educated workers, but it is assumed that in the case of primary students, opportunity costs are negligible. Most less developed countries are accurately characterized as economies with excess supplies of illiterate and unskilled labor, and under such conditions, it is unlikely that young children could be engaged in productive employment as an alternative to primary school. Therefore, it is the writer's judgment that the exclusion of opportunity costs will result in the most accurate measurement of the actual social rate of return to primary education.

III. Resource Allocation Amongst the Three Levels of Education

Casual observation of the *SMP*'s in Table 1 suggests that the return to primary education is significantly greater than the returns to the other levels in most of the countries. A few descriptive statistics support this observation. The unweighted mean return to primary education in the eighteen countries is 9.50, for secondary level education it is 2.37, and for college education the simple mean for sixteen countries is 2.00.[4] Thus, the average difference between the returns to primary and secondary education is 7.13, and the average difference between the returns to primary and college education is 8.54.[5] The average difference between the returns to secondary and college education is 0.53.

It is undoubtedly too presumptuous to conclude that these unsophisticated statistical results demonstrate the economic desirability of significant reallocations of resources from secondary and college education to primary education in less developed countries in general. Nonetheless, the results seem to allude to such a possibillity. Other research indicating significant relationships between literacy, primary education, and economic developm-

(4) These simple means are based upon the SMP's which have been calculated using a discount rate of 10 percent.

(5) This is the average difference between the SMP'S for primary and college education in the sixteen countries for which returns to college education have been estimated. Thus, the average difference of 8.54 is not exactly equal to the difference between the two means (9.5−2.0= 7.5), because of the exclusion of Puerto Rico and Zambia from the calculation.

ent has been interpreted as indicating this same conclusion (Bowles [4], Bowman and Anderson [7], and Peaslee [22]). On the other hand, investigation of the relationship between secondary education and economic development has produced more ambiguous results.(6)

It must be noted that relative returns to various levels of education reflect in large part the current and previous emphases placed upon these levels. Thus, the pattern identified above suggests that these countries have placed greater emphasis, relative to economic productivity, upon the two higher levels of education than upon primary education. In fact, there seems to be a general trend amongst less developed countries in the direction of placing increasing emphasis upon secondary education, especially of the technical variety. Various writers have emphasized the view that secondary educated manpower is the greatest bottleneck for less developed countries in the area of human capital.(7) However, the relatively low returns to secondary and college education (compared to primary education) identified in this paper certainly bring that point of view into question.

IV. The Average *SMP* of Education

In order to approximate the overall rate of education, the means of the *SMP*'s for each of the eighteen countries are calculated using enrollment data to weight the averages.(8) These *SMP*'s combined for all three levels of education are presented in Table 2.

The magnitudes of these combined *SMP*'s appear in general to be large which reflects the high *SMP*'s of primary education and the large absolute enrollments at the primary level. In most cases (excepting Israel and Zambia) the benefits of education exceed the costs (as indicated by a *SMP* greater than one) by wide margins. However, in the absence of any comparable rates of return to physical capital, it is impossible to make a specific conc-

(6) See especially Lewis [21].

(7) Harbison and Myers [16] place great emphasis upon this idea, and various manpower planning analyses have reached the same conclusion. See Bowles [6, pp. 192-196].

(8) Specifically, the means are calculated for the SMP's based upon the 10 percent social rate of discount. The combined SMP of education in each of the eighteen countries is calculated as $[SMP_p(E_p)+SMP_s(E_s)+SMP_c(E_c)]/E$ where SMP_p, SMP_s, and SMP_c are the SMP's of the respective levels of education E_p, E_s, and E_c are total student enrollments at each of the three levels of education, and E is aggregate student enrollment.

Table 2. The combined *SMP* of education and per capita income in eighteen countries.

Country	Combined SMP	Per capita income (1966—1968 US$)
Brazil	4.96	263
Chile	8.84	493
Colombia	17.24	300
Greece	2.04	679
India	18.06	73
Israel	0.84	1301
Kenya	5.15	116
Kora, Republic of	4.38	163
Malaysia	5.44	260
Mexico	11.00	511
Nigeria	11.26	70
Pakistan	18.28	131
Philippines	9.47	283
Puerto Rico	2.20	1389
Thailand	7.53	126
Uganda	10.26	100
Venezuela	8.92	803
Zambia	0.08	236

lusion regarding the allocation of resources between physical and human capital.

It is interesting to note that the combined *SMP*'s are significantly and negatively related to per capita income. The following results were obtained by regressing the combined SMP's upon per capita income:

$$(2)\quad SMP = 10.85 - .0067\ Y/P \qquad R^2 = .215$$
$$(.0031) \qquad n = 18$$

where Y/P=average per capita income in the time period 1966—1968. On the basis of these results, it can be concluded that the coefficient of the Y/P term is significantly different from zero at the .05 level of significance.[12]

One interpretation of these results relies upon the familiar principle of diminishing returns. Countries with low per capita incomes are also likely to have a small stock of human capital, and thus the returns to this relatively scarce factor of production are likely to be high. Diminishing returns

(12) $t = b/s_b = -0.0067/0.031 = -2.16$. The critical value of +7(1 degree of freedom and a level of significance of. 05) is ±2.11.

may be expected as the stock of human capital grows, which is most likely to occur in conjunction with economic development (increases in the level of per capita income). The results may also be interpreted as evidence supporting the crucial role of human capital formation via education in economic development. As a factor of production, human capital is probably much less mobile than physical capital. This may be particularly true of the flow of human capital from developed countries to less developed countries versus the corresponding flow of physical capital. For this reason, it would not be surprising to observe that the rate of return to physical capital is more stable over various ranges of per capita income, while rates of return to human capital fluctuate systematically as identified above. Thus, the evidence in this paper suggests that human capital formation may be particularly profitable (from the social perspective) at extremely low levels of development, and this may be especially true with respect to generating a stock of literate workers via primary education.

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