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Returns to Education: An Updated International Comparison

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Returns to Education: an updated international comparison

GEORGE PSACHAROPOULOS

One of the first questions that was asked following on from what Mary Jean Bowman (1966) described as the human capital revolution in economic thought, was: what is the profitability of investing in the new form of capital? Hesitantly, at first, but more eagerly thereafter, researchers around the world started estimating the social or private returns associated with educational and other human-capital-related expenditures for diverse population subgroups, from special samples, using a variety of assumptions and methodologies ranging from back of envelope calculations to extremely sophisticated econometric techniques.

The year 1973 was a landmark in the 'rate of return' literature—as it came to be known thereafter—because of the publication of the first systematic comparative study in this respect, (Psacharopoulos, 1973). A total of 53 rate of return case-studies were reviewed covering 32 countries.

This paper is an attempt to update the earlier rate of return evidence by considering studies that have been conducted in the seventies. The result of this update is the addition of 13 new country cases and a revision of most of the figures in the old country set.

However, I go beyond the compilation of comparable figures and discuss a series of controversial arguments that have been associated with the rate of return literature of the 1970s. Also, I try to give an interpretation of the summary findings following the expanded data set.

Trends in the Rate of Return Literature

Putting aside what is claimed to be the first empirical cost-benefit analysis of education by a Soviet economist (Strumilin, 1929) the real rate of return estimation activity started in the late fifties (see, e.g. Becker, 1960), T. W. Schultz's (1961) presidential address to the American Economic Association and the publication of Becker's (1964) NBER book gave a further boost to the subject, especially as a topic of PhD dissertations in US universities. The estimation procedure used during this first wave of rate of return literature was of the 'elaborate type', as described in the next section.

The second wave of the 'rate of return' literature starts somewhere in the early 1970s and is established with the publication of Mincer's (1974) NBER book. The estimation technique now becomes increasingly of the 'earnings function' type, as described in the next section. This technique is still going strong today and tends to be the dominant rate of return estimation procedure.

It is also interesting to note that the alternative to the rate of return cost-benefit measure, the

'net present value', has lost ground in the recent literature, mainly because it does not have a readily intelligible interpretation.

RATE OF RETURN ESTIMATION PROCEDURES

For the purpose of this paper it is sufficient to distinguish three main methods for estimating the rate of return to investment in education: the elaborate method, the earnings function method and the short-cut method.

(a) *The Elaborate Method*

This follows from the exact algebraic definition of the rate of return, which is the discount rate that equates a stream of benefits to a stream of costs at a given point in time. For example, consider the estimation of the private rate of return to investment in higher education in Fig. 1. If Y stands for labour earnings, and h and s subscripts for higher and secondary education, respectively, the rate of return (r) in this case is found by solving the following equation for r:

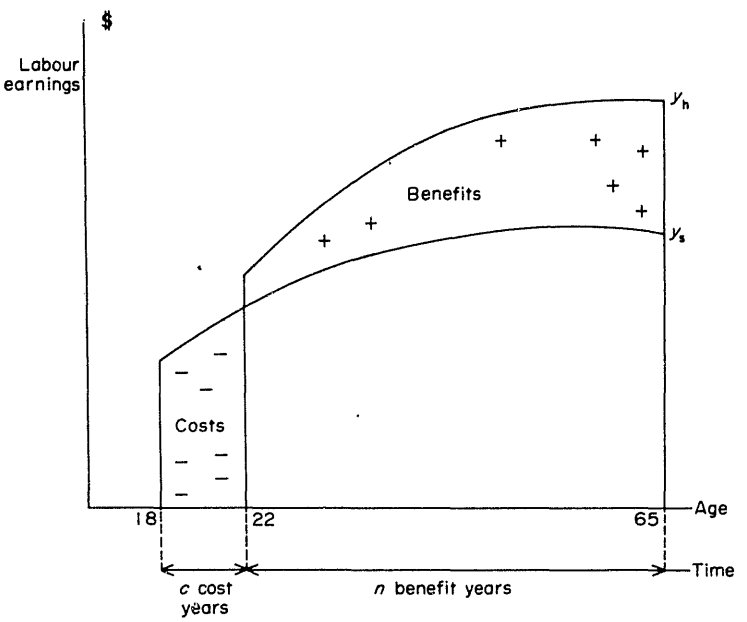

FIG. 1. A rate of return estimation according to the elaborate method.

discounted benefits to age 22 = cumulated costs at age 22.
(+ + + area) = (− − − area)

$$\sum_{t=1}^{n}(Y_h - Y_s)_t(1+r)^{-t} = \sum_{t=1}^{c}(Y_s)_t(1+r)^{t}. \qquad (1)$$

This high power equation is usually solved by an iterative computer programme that starts

from an arbitrary value of r and keeps modifying it by small increments in the right direction until the left-hand side is equal to the right-hand side.

Note that in the above *private* rate of return calculation the only cost of the 'education project' under evaluation is the opportunity cost of staying on in school beyond the age of 18 instead of working in the labour market. This opportunity cost is measured by the earnings of labour with secondary school qualifications.

Should the estimation of a *social* rate of return be desired, one can simply add the resource cost of an university place in the right-hand side of equation (1) and repeat the calculation. Of course earnings in this case should be before tax, whereas in the private rate of return calculation earnings should be after tax. But contrary to popular belief, the post- versus pre-tax treatment of earnings does *not* make a big difference in a rate of return calculation. It is the addition of the *direct cost* of schooling that mainly accounts for the fact that a social rate of return is lower relative to a private rate of return.

This way of estimating the profitability of investment in education requires in the first place detailed data on age-earnings profiles by educational level. This information is rare in most countries. Even if this information were available, the problem of small number cells arises. Namely, the plotted actual age-earnings profiles exhibit a saw-tooth patten making the rate of return estimation very sensitive, especially regarding the initial years after graduation which carry a high weight in the discounting.

It is for this reason smoothing-out procedures have been used, the rate of return being estimated in three steps: in step one a regression of the type:

$$Y_i = a + b \cdot \mathrm{AGE}_i + c \cdot \mathrm{AGE}_i^2 \qquad (2)$$

is fitted within subgroups of workers with the same educational level for the purpose of summarising the data.

In step 2 an idealised age-earnings profile is constructed by predicting the value of $\hat{Y}$ for given ages and educational levels, using the estimated function (2).

In step 3, the predicted values of earnings are inserted in formula (1), in order to compute the rate of return.

(b) *The Earnings Function Method*

Equation (2) in the above smoothing out procedure should not be confused with what is known as the earnings function method of estimating the rate of return. This is a regression of the basic form

$$\ln Y_i = a + b \cdot S_i + c \cdot \mathrm{EX}_i + d \cdot \mathrm{EX}_i^2 \qquad (3)$$

where S is the number of years of schooling of the individual (i) and EX his years of labour market experience. Equation (2) is an *ad hoc* fitting regression. Equation (3) is based on human capital theory where $b = r$, i.e. the estimated regression coefficient (b) is interpreted as the *average private* rate of return to one extra year of schooling.

An illustrative proof of this proposition (that is essentially due to Mincer, 1974) is that

$$b = \frac{\partial \ln Y}{\partial S} = r, \qquad (4)$$

i.e. the rate of return is nothing else than the relative change in earnings ($\partial \ln Y$) following a given change in schooling (∂S).

There exist two ways one can add an educational level dimension to this 'average' rate of return concept. The first way is to add an $e \cdot S^2$ term in equation (3), where e is the estimated coefficient on years-of-schooling-squared. In this case, differentiation with respect to S yields

$$r = b + 2eS. \qquad (5)$$

By substituting different values of S in the right-hand side of equation (5), one can arrive at a regression-derived rate of return structure corresponding, say, to primary education ($S=6$), secondary education ($S=12$) and higher education ($S=16$).

The second way is to specify different educational levels in the earnings function by means of a series of dummy variables, say PRIM, SEC and HIGH, having a value of 1 if the individual belongs to the particular educational level and 0 otherwise:

$$\ln Y = a + b \cdot \text{PRIM} + c \cdot \text{SEC} + d \cdot \text{HIGH} + e \cdot \text{EX} + f \cdot \text{EX}^2. \qquad (6)$$

In this case, the rates of return to the different levels of education are derived from the estimated coefficients b, c and d in the above function as follows:

$$r_{(\text{primary vs illiterates})} = \frac{b}{S_p}$$

$$r_{(\text{secondary vs primary})} = \frac{c-b}{S_s - S_p}$$

$$r_{(\text{higher vs secondary})} = \frac{d-c}{S_h - S_s}$$

where S stands for the number of years of schooling of the subscripted educational level (p = primary, s = secondary and h = higher).

The rationale of this procedure is that effectively one computes the rate of return by means of the following formula that is educational-level-specific

$$r_k = \frac{\ln Y_k - \ln Y_{k-\Delta S}}{\Delta S}. \qquad (7)$$

Here k is the higher educational level in the comparison and ΔS the difference in years of schooling between k and the control group.

The advantage of estimating the rate of return by the dummy variable method rather than the years-of-schooling-squared method is that a great deal of sensitivity is added; i.e. the actual rate of return structure might not be as smooth as that suggested by formula (5).

However, the problem with the earnings function approach in general is that the rates of

eturn are estimated on the basis of the following implicit assumptions:

(i) the age-earnings profiles are either flat or equidistant between adjacent educational levels throughout their range;
(ii) the age-earnings profiles last for ever (to infinity); and
(iii) the only cost of schooling is the foregone earnings of the individual (see Fig. 2).

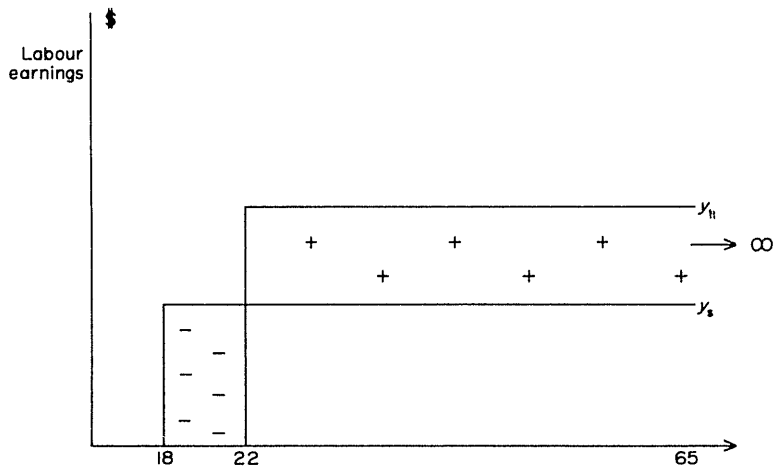

FIG. 2. The rate of return estimation procedure implicit in the short-cut method.

These assumptions are not as damaging or unrealistic as they seem and they have been sufficiently defended (and debated) in the earnings function literature (see, e.g. Blinder, 1976). For example, the fact that age-earnings profiles are assumed to last for ever makes little difference to the discounted present value and hence the estimated rate of return.

The main problems with this method, however, are first, one cannot readily incorporate cost data in order to estimate social rates of return, and secondly, this method understates the returns to primary education. The reason for the downward bias on the return to primary education is that *the estimation formula automatically assigns foregone earnings to primary school children.* This is just not true in most country settings and one should have this understatement in mind when interpreting the results.

c) *The Short-Cut Method*

This amounts to doing in an explicit way what the earnings function method is doing implicitly, i.e. the returns to education are estimated on the basis of the simple formula

$$r_k = \frac{\overline{Y}_{k-}\overline{Y}_{k-\Delta s}}{S\cdot(\overline{Y}_{k-\Delta S})} \qquad (8)$$

where $\overline{Y}$ refers to mean earnings of employees with the subscripted educational level. Formulae (7) and (8) are very similar, the difference lying in the mathematical approximation $\ln(1+x)\simeq x$ which is good for values of x of the order of the rate of return to education. The great advantage of this formula is that one can use already tabulated information on the

earnings of workers by educational level in order to estimate the private rate of return. Also, i is rather easy to add the resource cost of schooling in the denominator in order to estimate th social returns. Hence, it is of great value in cases where information on individual earnings i not available.

Of course the main problem with this formula is that the age (or experience) standardisatio is absent. However, this can be rectified in case the mean earnings by educational level ar available for large age groups. Then choice of, say, the 35–45 age group for computation of th rate of return somehow prevents biases associated with the early experience profiles.

AN UPDATED RATE OF RETURN SET

Table I presents private and social rates of return by educational level in 44 countries. This i an update of table 4.1 in my 1973 book. Estimates based on old surveys were replaced b newer ones when available, as in the case of Kenya, India, Philippines, Brazil, Colombia Greece, Belgium, Japan, Malaysia, United Kingdom and the United States. New countr observations were added referring to Ethiopia, Malawi, Morocco, Sierra Leone, Indonesia Taiwan, Cyprus, Spain, Yugoslavia, Iran, France and Italy. And, faute de mieux, the previou set of rates of return was retained in countries where no newer estimates were available.

As in the previous compilation, an attempt was made to include rates of return a comparable as possible between countries. Thus, where the relevant information was availabl in the original study, the reported rates are:

Marginal, in the sense that they refer to investment at the margin between the educationa levels considered (e.g. primary graduation vs illiterates, secondary general vs primary an higher education vs secondary general).

Unadjusted, for economic growth, ability differences and unemployment. (The rationale fo this choice is explained in a later section of this paper.)

Elaborate-method derived in most cases (except in the cases of Colombia, Cyprus, and th United Kingdom where the regression method was used, and Malawi, Indonesia and Ital where the short-cut method was used).

Rate of Return Patterns

Nobody can claim that the combination of diverse assumptions, estimation procedures, sampl data and years of reference would have ever resulted to an absolutely comparable rate o return set to the last decimal point. But Table I contains some strong features that cannot b due to comparability biases. The rate of return patterns in this table are fully compatible validate and reinforce the conclusions reached on the basis of the 1973 international compari son. It is easier to discover the underlying patterns by averaging within country groups, a shown in Table II.

Pattern No. 1 The returns to primary education (whether social or private) are the highes among all educational levels.

Pattern No. 2 The private returns are in excess of social returns, especially at the universit level.

Pattern No. 3 All rates of return to investment in education are well above the 10% commo yardstick of the opportunity cost of capital.

Pattern No. 4 The returns to education in developing countries are higher relative to th corresponding returns in more advanced countries.

The above four propositions not only make economic sense, but also have important polic implications to be elaborated in the last section of this paper.

TABLE I
Returns to education by level and country type (%)

Country	Survey year	Private			Social		
		Prim.	Sec.	Higher	Prim.	Sec.	Higher
Africa							
Ethiopia	1972	35·0	22·8	27·4	20·3	18·7	9·7
Ghana	1967	24·5	17·0	37·0	18·0	13·0	16·5
Kenya*	1971	28·0	33·0	31·0	21·7	19·2	8·8
Malawi	1978					15·1	
Morocco	1970				50·5	10·0	13·0
Nigeria	1966	30·0	14·0	34·0	23·0	12·8	17·0
Rhodesia	1960				12·4		
Sierra Leone	1971				20·0	22·0	9·5
Uganda	1965				66·0	28·6	12·0
Asia							
India	1965	17·3	18·8	16·2	13·4	15·5	10·3
Indonesia	1977	25·5	15·6				
South Korea	1967				12·0	9·0	5·0
Malaysia	1978		32·6	34·5			
Philippines	1971	9·0	6·5	9·5	7·0	6·5	8·5
Singapore	1966		20·0	25·4	6·6	17·6	14·1
Taiwan	1972	50·0	12·7	15·8	27·0	12·3	17·7
Thailand	1970	56·0	14·5	14·0	30·5	13·0	11·0
Latin America							
Brazil	1970		24·7	13·9		23·5	13·1
Chile	1959				24·0	16·9	12·2
Colombia	1973	15·1	15·4	20·7			
Mexico	1963	32·0	23·0	29·0	25·0	17·0	23·0
Venezuela	1957		18·0	27·0	82·0	17·0	23·0
Intermediate							
Cyprus	1975	15·0	11·2	14·8			
Greece	1977	20·0	6·0	5·5	16·5	5·5	4·5
Spain	1971	31·6	10·2	15·5	17·2	8·6	12·8
Turkey	1968		24·0	26·0			8·5
Yugoslavia	1969	7·6	15·3	2·6	9·3	15·4	2·8
Israel	1958	27·0	6·9	8·0	16·5	6·9	6·6
Iran	1976		21·2	18·5	15·2	17·6	13·6
Puerto Rico	1959		38·6	41·1	21·9	27·3	21·9
Advanced							
Australia	1969		14·0	13·9			
Belgium	1960		21·2	8·7		17·1	6·7
Canada	1961		16·3	19·7		11·7	14·0
Denmark	1964			10·0			7·8
France	1970		13·8	16·7		10·1	10·9
Germany	1964			4·6			
Italy	1969		17·3	18·3			
Japan	1973		5·9	8·1		4·6	6·4

TABLE I *(continued)*

Country	Survey year	Private			Social		
		Prim.	Sec.	Higher	Prim.	Sec.	Higher
Netherlands	1965		8·5	10·4		5·2	5·5
New Zealand	1966		20·0	14·7		19·4	13·2
Norway	1966		7·4	7·7		7·2	7·5
Sweden	1967			10·3		10·5	9·2
United Kingdom†	1972		11·7	9·6		3·6	8·2
United States	1969		18·8	15·4		10·9	10·9

Source:

Ethiopia	from Hoerr (1974, table 3).
Kenya	private rates, from Fields (1975, table II).
Malawi	preliminary estimate based on Heyneman (1980a).
Morocco	from Psacharopoulos (1976, p. 136).
Sierra Leone	from Ketkar (1974, table 5).
India	from Pandit (1976) as reported by Heyneman (1980b, p. 146).
Indonesia	from Hallak & Psacharopoulos (1979, p. 13).
Malaysia	from Lee (1980).
Philippines	from ILO (1974, p. 635).
Singapore	from Clark & Fong (1970).
Taiwan	from Gannicott (1972)
Brazil	from Jallade (1977, table 4).
Colombia	regression-derived from Fields & Schultz (1977, table 8A, col.(4)).
Cyprus	from Demetriades & Psacharopoulos (1979, table 9).
Greece	from Psacharopoulos & Kazamias (1978, table 19.1).
Spain	from Quintas & Sanmartin (1978, table 1).
Turkey	from Krueger (1972, table 4).
Yugoslavia	from Thomas (1976, table 3).
Iran	from Pourhosseini (1979).
Puerto Rico	from Carnoy (1972).
Australia	from Blandy & Goldsworthy (1973, p. 9).
Belgium	from Meulders (1974, table II).
France	from Eicher & Lévy-Garboua (1979, chapter 5).
Italy	based on income data from Bank of Italy (1972, table 10).
Japan	from Umetani (1977, pp. 113–114).
United Kingdom	private rates from Psacharopoulos & Layard (1979, table IX).
USA	from Carnoy & Marenbach (1975).

Ghana, Nigeria, Uganda, South Korea, Thailand, Chile, Mexico, Venezuela, Israel, Canada, Denmark, Germany, Netherlands, New Zealand, Norway, Sweden and the United Kingdom (social returns only) from Psacharopoulos (1973, p. 62).

Notes

* Social rates refer to 1968. † Social rates refer to 1966.

TABLE II
The returns to education by region and country type (%)

Region or country type	*N*	Private			Social		
		Prim.	Sec.	High.	Prim.	Sec.	High
Africa	(9)	29	22	32	29	17	12
Asia	(8)	32	17	19	16	12	11
Latin America	(5)	24	20	23	44	17	18
LDC average	(22)	29	19	24	27	16	13
Intermediate	(8)	20	17	17	16	14	10
Advanced	(14)	(a)	14	12	(a)	10	9

Source: Table I.
(a) Not computable because of lack of a control group of illiterates.
N = Number of countries in each group.
Prim. = primary educational level.
Sec. = secondary educational level.
High. = higher educational level.

Evidence from Earnings Functions

Table III presents another compilation of rates of return, this time derived exclusively from earnings functions. In most cases, the reported coefficient is the partial derivative of the logarithm of earnings with respect to years of schooling, years of labour market experience or age, being held constant. As noted earlier, the resulting rate of return is private and does not refer to any particular educational level. In poor countries, however, it must refer to the typical year of primary education as the mode of years of schooling distribution corresponds to this level. It is in this sense that the rates of return reported in Table III are underestimates of the true profitability of education at the lower educational level as they incorporate the implicit assumption of foregone earnings at an early age.

Table IV provides a summary of earnings-functions derived rates of return by country type. Again, the same overall pattern is observed, namely the returns decline with the level of economic development.

ON QUALIFICATIONS AND CONTROVERSIES

The 'rate of return' subject is still highly controversial in the literature, although it is now more widely accepted than, say, 15 years ago. Let us give a brief summary of the major objections raised against the usefulness of rates of return as a tool for the formulation of educational policy, along with the answer of the proponents of this concept.

Data Quality

This is a problem common in all empirical work and the rate of return estimation makes no exception to it. In the above international comparison I would put greatest faith in the estimates referring to the United States and the United Kingdom, since I known these numbers come from official census statistics using rigorous sampling techniques covering the population as a whole. At the same time I would put least faith in the rate of return estimates for Yugoslavia, the information coming from a short article where the reporting of the exact sampling procedures, response errors etc. cannot be described in detail. This does not mean,

TABLE III
The percent increment in earnings associated with one extra year of schooling

Country	Year	$\frac{\partial \ln Y}{\partial S}$	Source
Africa			
Ethiopia	1972	8·0	Hoerr (1974)
Kenya	1970	16·4	Johnson (1972)
Morocco	1970	15·8	Psacharopoulos (1977a)
Asia			
Malaysia	1978	22·8	Lee (1980)
Singapore	1974	8·0	Fong (1976)
S. Vietnam	1964	16·8	Stroup & Hargrove (1969)
Thailand	1971	10·4	Chiswick (1976)
Taiwan	1972	6·0	Cannicott (1972)
Latin America			
Brazil	1970	19·2	Psacharopoulos (1980a)
Colombia	1973	20·5	Fields & Schultz (1977)
Mexico	1963	15·0	Carnoy (1967)
Intermediate			
Cyprus	1975	12·5	Demetriades & Psacharopoulos (1979)
Greece	1977	5·9	Psacharopoulos & Kazamias (1978)
Iran	1976	10·7	Scully (1979)
Advanced			
Canada	1971	5·2	Gunderson (1979)
France	1964	10·9	Riboud (1975)
Japan	1970	7·3	Kuratani (1973)
Sweden	1974	6·7	Gustafsson (1977)
United Kingdom	1975	7·8	Psacharopoulos (1980b)
United States	1973	8·2	Young & Jamison (1975)

TABLE IV
The returns to education irrespective of educational level, country group averages

Region or country type	*N*	Rate of return (%)
Africa	(3)	13·4
Asia	(5)	12·8
Latin America	(3)	18·2
LDC average	(11)	14·4
Intermediate	(3)	9·7
Advanced	(6)	7·7

Source: Table III.
Note: rate of return is private, estimated by an earnings function and refers to the average year of schooling.

however, that one has to dismiss such estimates as unreliable. The criterion here is that the particular author and/or journal referee/or PhD thesis committee felt the quality of the work was suitable for 'publication' (in the wider sense of the term).

In some country cases I had a choice between alternative estimates from several authors using different estimation procedures or sample bases. The rates of return I retained in such case were from the study that in my opinion was the best in terms of comparability to the rest.

The Social Productivity of Education

This is the most often cited objection to rate of return estimations; namely, one cannot approximate the true social productivity of education by working with the earnings of employees by level of educational attainment. This common-sense objection has recently been weakened because of an accumulation of studies on the effect of education on farmers' productivity (see, e.g. Jamison & Lau, 1978). If more education (mostly at the basic level) contributes (other things being equal) to extra rice production, this extra rice is an ultimate demonstration of the social productivity of education.

At the higher levels of education where the production of, say, university graduates, cannot be measured in such tangible terms, objections here have been raised to the use of earnings as a proxy for productivity. These objections take specific labels and the major ones are known in the literature as 'screening or certification', 'bumping or job competition' and 'labour market segmentation'. All these are very sensible, common-sense hypotheses and have appealed to many analysts and politicians alike. However, these hypotheses are found wanting when put to the test.

Screening or Certification [1]

What this theory says is that schools produce just diplomas or sheepskins helping the holder to get a *privately* well paid job, although the *social* payoff of the human investment he has undertaken might be minimal [2]. However, there exists one major objection to this view: when one makes the distinction between 'initial' and 'persistent' screening, it is very hard to find evidence corroborating the latter, namely that employers keep paying wages above the worker's productivity *after* they have the employee under their observation for some time [3]. Initial screening certainly exists, i.e. employers may hire someone on the basis of his expected productivity given his educational qualifications. But there is nothing wrong with it as, after all, it has an informational social value (see Psacharopoulos, 1980c).

Differential Ability

Embedded in the screening argument is the ability factor: because those who have more education than others allegedly also have a higher level of ability, wage differentials are not solely due to learning, a great part of them being due to differential ability. This highly intuitive argument combined with some aggregate, cross-tabulation evidence by Becker (1964) and Denison (1967) resulted in the enthronement of this myth. However, micro-data plus scrutinisation of what 'ability' really means resulted in the highly counter-intuitive finding that ability differentials do not account for much of the variation in earnings (see Psacharopoulos, 1975 and Griliches, 1979).

The Job Competition or Bumping Model

This is another highly intuitive notion, i.e. workers compete for jobs rather than wages, and those with more educational qualifications bump out from the labour queue the less qualified

and get the job [1]. That is certainly true, but this view fails to show why such bumping should be socially wrong. If the more qualified perform better in the job they are in, this is socially healthy. There exists plenty of micro-evidence that the latter is likely to be the case as the more qualified earn more relatively to the less qualified even after one standardises for occupation.

Is there a Dual Labour Market?

Another attack comes from the so-called dual or segmented labour market hypothesis (Gordon, 1972). According to it, education helps workers belonging to the 'primary segment' of the market (i.e. those in good jobs), but not those in the 'secondary segment' (i.e. those with inferior jobs). For several reasons the dual labour market fashion that started in the early 1970s has already faded away, although it is still echoed in some quarters (for a critique see Cain, 1976). In the first place, testing it is extremely difficult because the hypothesis has never been stated in a rigorous manner. Secondly, the separation of the upper from the lower segment is a major problem on its own. Where should one draw the dividing line between the two allegedly separate labour markets? Also, empirical attempts to test whatever bits and pieces of the theory are testable have failed to reject the orthodox functioning of labour markets (see Psacharopoulos, 1978 and McNabb & Psacharopoulos, 1981).

On Social Class

Another commonly held belief is that education serves the maintenance of the *status quo* from generation to generation (Bowles, 1972). Although this might be true to a large extent, it does not constitute a challenge to the use of earnings as a proxy for productivity. For two interesting recent results show that, first, family background (or social class) has only an indirect effect on earnings and this is via education. The direct effect of social background on earnings is rather weak. Also, it is those who acquire more education that are socially more upwardly mobile (Psacharopoulos, 1977b and Psacharopoulos & Tinbergen, 1978).

The Role of the Public Sector

In some instances, rates of return have been estimated on the basis of public sector earnings. Since the public sector is the major employer of educated labour in developing countries, its non-profit maximising behaviour has been used as an argument against the use of earnings in rate of return computations. However, recent evidence from Brazil and Malaysia on public-private sector comparisons indicates that the contrary is likely to be the case. Namely, public sector based rate of return calculations are likely to *under*estimate the true returns to education, as judged from private sector employment (see Psacharopoulos, 1980d).

Graduate Unemployment

One widespread view is that education produces unemployed graduates. This is a more serious challenge relative to the ones mentioned above, as it denies even the private benefits accruing to the individual investor. However, this argument is put in the right perspective when a distinction is made between the *incidence* and the *duration* of unemployment. Unemployment is high among young people; but in the majority of cases it lasts for a few months at the most. (For detailed evidence on the incidence and duration of unemployment as related to education in developing countries, see Psacharopoulos, 1980d.) Hence, one might consider the lack of employment immediately after graduation to be the reflection of a 'job search' process. And certainly it would be a mistake to reduce a whole age-earnings profile by the average rate of unemployment that mainly refers to young people.

SOME POLICY IMPLICATIONS

To the extent that the figures presented above, represent valid indicators of the true relative rate of return structure by level of education and country type, they have at least the following specific policy implications:

Policy Implication No. 1

A look at Fig. 3 leaves no doubt that top priority should be given to primary education as a form of human resource investment.

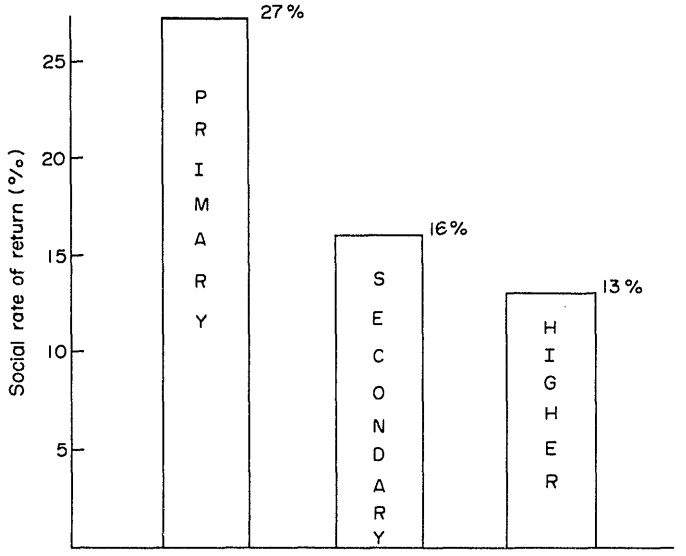

FIG. 3. The social returns to investment in education by school level in LDCs. Source: as in Table I. Note: LDCs refer to 22 African, Asian and Latin American countries.

Policy Implication No. 2

Secondary and higher education are also socially profitable investments and therefore should be pursued alongside with primary education in a programme of balanced human resource development.

Policy Implication No. 3

The large discrepancy between the private and social returns to investment in higher education (24 vs 13%, respectively) suggests there exists room for private finance at the university level. A shift of part of the cost burden from the state to the individual and his family is not likely to lead to a disincentive of investing in higher education given the present high private profitability margin.

Policy Implication No. 4

As a country develops and/or the capacity of its educational system expands, the returns to education are definitely falling, although not to a large extent. Therefore, the fear of a drastic fall of the returns to education following educational expansion is unfounded.

Since this fear is a commonly held belief among educational planning practitioners, the following sub-section elaborates this point.

Educational Expansion and Rates of Return

The evidence needed to investigate this topic is time-series rates of return, a luxury available in only a couple of countries. But even if one had a complete historical time trend of rates of return, this is no guarantee that their structure will be valid in the future beyond the available range of observations. Therefore, in making predictions in this respect one must also rely on a theory of some sort.

The international comparison presented earlier provides the basis for a cross-sectional reconstruction of time series by comparing the returns to education at different levels of economic development. From Table II one gets the following world-wide picture:

	Social returns to investment in education (%)		
Country type	Primary	Secondary	Higher
LDC	27	16	13
Intermediate	16	14	10
Advanced	na	10	9

Namely, the returns do fall as a country passes from one stage of development to the next, which occurs *pari passu* with educational expansion. However, the decline of the returns is minimal when one considers the big educational expansion steps implied between rows in the above tabulation.

Also, the international comparison of earnings functions yields the following picture regarding the returns to the typical year of schooling by country type:

Country type	Rate of return
LDC	14
Intermediate	10
Advanced	8

Namely, the same conclusion is supported regarding the gradual fall of the overall rate of return associated with economic development (read, educational expansion).

Moving beyond these extremely aggregate figures, we can concentrate on what has happened within single countries where time-series evidence is available on the returns to

education. One cannot be very choosey in this respect, so here is the picture of what has happened in one DC and one LDC.

The United States

Rate of return estimates for this country exist for every census year since 1939 and for every single year since 1970. Table V gives a summary picture of the evolution of the rate of return over nearly 40 years. The returns to education have been falling, although to a limited extent. The rate of return to secondary education fluctuates since 1959 at above the 10% level. The rate of return to higher education has been virtually constant at the 11% level between 1939 and 1969, in spite of the tremendous college expansion that occurred during the 1960's. Thereafter, it seems to be dropping, although there exists great controversy in the literature on the validity and interpretation of this decline [5].

TABLE V
Time series returns to education in the United States (%)

Year	Secondary	Higher
1939	18·2	10·7
1949	14·2	10·6
1959	10·1	11·3
1969	10·7	10·9
1970	11·3	8·8
1971	12·5	8·0
1972	11·3	7·8
1973	12·0	5·5
1974	14·8	4·8
1975	12·8	5·3
1976	11·0	5·3

Source: 1939–69 social rates from Carnoy & Marenbach (1975, table 2).
1970–76 private rates from Psacharopoulos, (1980e, table 4).

The apparent 'puzzle' of the stability of the returns to education in the presence of educational expansion has been explained in terms of supply and demand terms, namely the demand for educated labour keeps pace with a rapidly increasing supply, the end result being a near constant rate of return (see, e.g. Welch, 1970). Or, to put it in Tinbergen's (1975) terms, this phenomenon can be explained in terms of a 'race' between education (supply curve shifting to the right) and technology (demand curve shifting to the right), as shown in Fig. 4.

Colombia

As shown in Table VI the structure of the Colombian labour force has shown a dramatic improvement within a decade, the proportion of university graduates doubling between 1964 and 1974. The question is what happened to the rate of return during this period?

As expected, the rates of return have in fact fallen (Table VII) although investment in education at all levels remains a highly profitable activity.

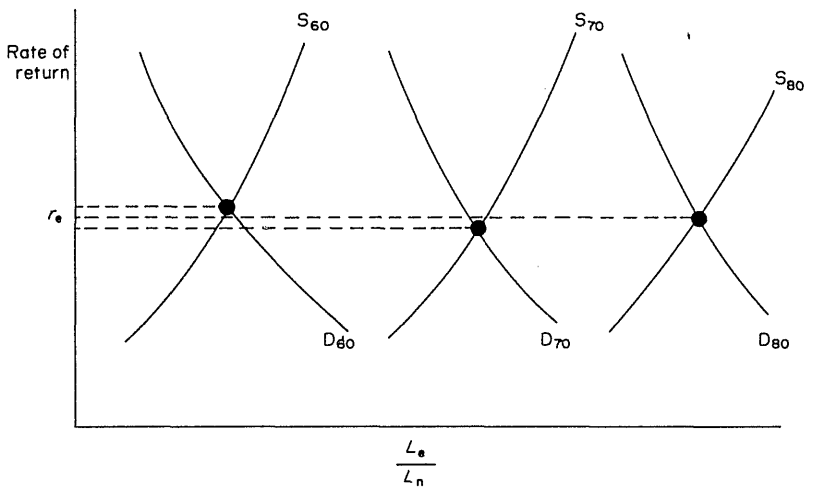

FIG. 4. A hypothetical 'race' between education and technology resulting in a more or less constant rate of return to education over time. S = supply curve; D = demand curve; L = labour; r = rate of return. Subscripts: e = educated; n = non-educate; 60, 70, 80 = year.

TABLE VI
The changing educational structure of the Colombian labour force (%)

Educational level	1964	1974
Illiterates	5·0	3·5
Primary school	57·3	45·4
Secondary school	29·5	34·8
Higher eduction	8·2	16·3

Source: Bourgignon (1980, table 1).

TABLE VII
The returns to education in Colombia by educational level

Educational level	1963–66	1974
Primary	53·1	36·0
Secondary	31·7	21·9
Higher	29·2	18·5

Source: based on Bourgignon (1980, table 5). Rates are private calculated by the short-cut method.

Additional evidence from earnings functions analysis corroborates this result:

Year	Rate of return
1963–66	19·8
1965	17·3
1971	16·7
1974	15·1

Source: Bourgignon (1980, table 4).

An earlier analysis by Dougherty (1971) using 1963–66 data has actually simulated the behaviour of the rate of return as a function of educational expansion in Colombia. Fig. 5 shows the expected path of the rate of return to secondary education if enrolments followed the historical growth rate of 10% per year (path A) or a hypothetical 15% rate (path B). As expected, the returns to education fall but not so drastically that this type of investment becomes socially unprofitable in a 16-year interval.

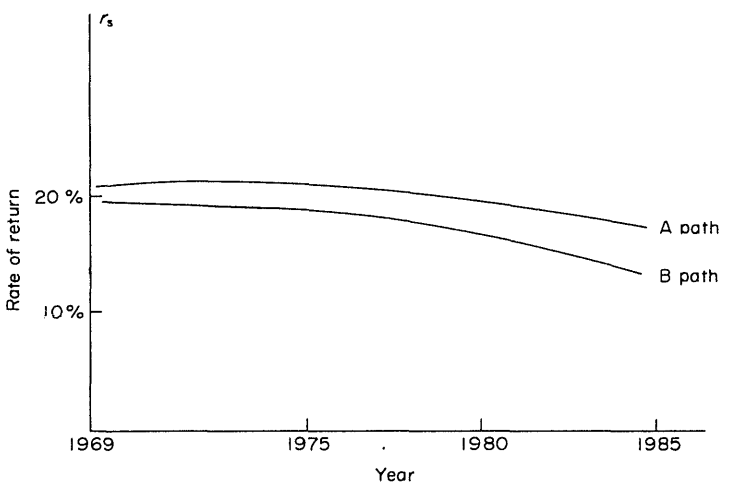

FIG. 5. An actual simulation of the social rate of return to secondary education in Colombia as a function of enrolments. Note: figure is approximate. r_s = rate of return to secondary education; A path = based on the assumption of a 10% per year historical expansion of enrolments; B path = based on a hypothetical 15% per year growth of enrolments.

This earlier analysis has also demonstrated using Colombian data the importance of the 'elasticity of substitution' between different types of educated labour in affecting the future structure of rates of return [6]. This concept measures the degree of easiness or flexibility that exists in a given economy to accommodate different labour skill mixes in production without affecting the relative labour rewards. The higher the value of the elasticity of substitution, the longer a present rate of return measure will remain valid in the future following educational expansion.

There exists an immense literature on empirical estimates of elasticities of substitution between different types of labour in a variety of country settings. As shown in Table VIII this elasticity is on high side, i.e. well above the value of unity. This evidence supports a theory on the basis of which one can confidently plan for educational expansion without affecting the rate of return to the point of such investment becoming socially unprofitable. At least this is

TABLE VIII

Estimates of the elasticity of substitution between highly trained and other labour (absolute values)

Nature of study	Elasticity estimate	Author
Cross-section, 22 countries	1	OECD (1971)
Cross-section, 22 US States	3·3–9·0	Dougherty (1972)
Cross-section, 12 countries	4·8	Bowles (1969)
Cross-section, 18 countries	2·2	Psacharopoulos & Hinchliffe (1972)
Time series, USA 1956–68	3·8	Dresch (1976)
Cross-section, 22 countries	0·6–3·5	Fallon & Layard (1975)
Time series, USA 1929–68	4·9–6·1	Bernt & Christensen (1974)
Time series, USA	2·3	Freeman (1971)
Time series, USA 1900–63	1·5	Ullman (1972)

Source: As compiled from original sources by Tinbergen & Psacharopoulos (1980).

what might be expected in the medium term in LDCs where the returns to the lower levels of schooling are of such magnitude that the possibility of over-investing in education is extremely remote.

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NOTES

[1] This sub-section partly draws from Psacharopoulos (1980b) to which the reader is referred to for further elaboration of points.

[2] For a formal analysis of the screening hypothesis see Arrow (1973). For empirical tests see Layard & Psacharopoulos (1974).

[3] For a theoretical distinction and an empirical test between the 'weak' versus the 'strong' version of the screening hypothesis, see Psacharopoulos (1979).

[4] For the main variant of this model see Thurow & Lucas (1972).

[5] See Freeman (1976), Smith & Welch (1978) and the exchange in the Winter 1980 issue of the *Journal of Human Resources.*

[6] See also Dougherty (1972).

REFERENCES

ARROW, K. (1973) Higher education as a filter, *Journal of Public Economics*, July.

BANK OF ITALY (1972) *Quindicinale di Note e Commenti*, Anno VIII, N.162–63, 15 May.

BECKER, G. (1960) Underinvestment in college education?, *American Economic Review*, May.

BECKER, G. (1964) *Human Capital*, 1st edn (NBER).

BERNT, E.R. & CHRISTENSEN, L.R. (1974) Testing for the existence of a consistent aggregate index of labour inputs, *American Economic Review*, p. 391.

BLANDY, R. & GOLDSWORTHY, T. (1973) Private returns to education in South Australia, *Working Paper No. 3* (Institute of Labour Studies, The Flinders University of South Australia).

BLINDER, A. S. (1976) On dogmatism in human capital theory, *Journal of Human Resources*, Winter.

BOWLES, S. (1969) *Planning Educational Systems for Economic Growth* (Harvard University Press).

BOWLES, S. (1972) Schooling and inequality from generation to generation, *Journal of Political Economy*, May–June, Supplement.

BOWMAN, M. J. (1966) The human investment revolution in economic thought, *Sociology of Education*, Vol. 39, No. 2.

BOURGIGNON, F. (1980) The role of education in the urban labour market during the process of development: the case of Colombia, paper presented at the *6th World Congress of the International Economic Association*, Mexico City, August.

CAIN, G. (1976) The challenge of segmented labour market theories to orthodox theory: a survey, *Journal of Economic Literature*, December.

CARNOY, M. (1967) Earnings and schooling in Mexico, *Economic Development and Cultural Change*, July.

CARNOY, M. (1972) The rate of return to schooling and the increase in human resources in Puerto Rico, *Comparative Education Review*, February.

CARNOY, M. & MARENBACH, D. (1975) The return to schooling in the United States, 1939–69, *Journal of Human Resources*, Summer.

CHISWICK, C. (1976) On estimating earnings functions for LDC's, *Journal of Development Economics*, pp. 67–78.

CLARK, D. H. & FONG, P. E. (1970) Returns to schooling and training in Singapore, *Malayan Economic Review*, October.

DEMETRIADES, E. & PSACHAROPOULOS, G. (1979) Education and pay structure in Cyprus, *International Labour Review*, January–February.

DENISON, E. F. (1967) *Why Growth Rates Differ?* (The Brookings Institution).

DOUGHERTY, C. R. S. (1971) Optimal allocation of investment in education, in: CHENERY, H. B. (Ed.) *Studies in Development Planning* (Harvard University Press).

DOUGHERTY, C. R. S. (1972) Estimates of Labour Aggregation Functions, *Journal of Political Economy*, November.

DRESCH, S. P. (1976) Demography, Technology and higher education, *Journal of Political Economy*.

EICHER, J.-C. & LEVY-GARBOUA, L. (1979) *Economique de l'Education* (Paris, Economica).

FALLON, P. & LAYARD, R. (1975) Capital-skill complementarity, income distribution and output accounting, *Journal of Political Economy*.

FIELDS, G. S. (1975) Higher education and income distribution in a less developed country, *Oxford Economic Papers*, July.

FIELDS, G. S. & SCHULTZ, T. P. (1977) Sources of income variation in Colombia: Personal and regional effects, *Paper No. 272* (Economic Growth Center, Yale University).

FONG, P. E. (1976) Education, earnings and occupational mobility in Singapore, (ILO, World Employment Programme). *Paper WEP 2-18/WP 13.*

FREEMAN, R. (1971) *The Market for College Trained Manpower* (Harvard University Press).

FREEMAN, R. (1976) *The Overeducated American* (London, Academic Press).

GANNICOTT, K. (1972) *Rates of return to education in Taiwan, Republic of China* (Planning Unit, Ministry of Education, mimeo).

GORDON, D. (1972) *Theories of Poverty and Unemployment* (Lexington).

GRILICHES, Z. (1979) Sibling models and data in economics: beginnings of survey, *Journal of Political Economy*, October, Supplement.

GUNDERSON, M. (1979) Earnings differentials between the public and private sectors, *Canadian Journal of Economics*, May.

GUSTAFSSON, S. (1977) Rates of depreciation of human capital due to nonuse, *Working Paper No. 14*, (The Industrial Institute for Economic and Social Research).

HALLAK, J. & PSACHAROPOULOS, G. (1979) The role of education in labour recruitment and promotion practices in Indonesia, *IIEP Working Paper.*

HEYNEMAN, S. (1980a) *The Status of Human Capital in Malawi*, March draft (World Bank, Education Department).

HEYNEMAN, S. (1980b) Investment in Indian education: uneconomic? *World Development*, pp. 145–163.

HOERR, D. (1974) Educational returns and educational reform in Ethiopia, *Eastern Africa Economic Review*, December.

ILO (1974) *Sharing in Development: a Programme of Employment, Equity and Growth for the Philippines.*

JALLADE, J. P. (1977) Basic education and income inequality in Brazil: the long term view, *Staff Working Paper No. 268* (World Bank).

JAMISON, D. & LAU, L. (1978) *Farmer education and farm efficiency*, (World Bank, mimeo).

JOHNSON, G. E. (1972) The determination of individual hourly earnings in urban Kenya, *Paper No. 22* (Center for Research on Economic Development, University of Michigan).

KETKAR, S. L. (1974) Benefit-cost analysis, manpower training and the Sierra Leone educational system, no affiliation.

KRUEGER, A. O. (1972) Rates of return to Turkish higher education, *Journal of Human Resources*, Fall.

KURATANI, M. (1973) A theory of training, earnings and employment: an application to Japan, *unpublished PhD dissertation*, Columbia University.

LAYARD, R. & PSACHAROPOULOS, G. (1974) The screening hypothesis and the returns to education, *Journal of Political Economy*.

LEE, K. H. (1980) Education, earnings and occupational status in Malaysia, 1978, *unpublished PhD dissertation*, London School of Economics.

MCNABB, R. & PSACHAROPOULOS, G. (1981) Further evidence on the relevance of the labour market hypothesis for the U.K., *Journal of Human Resources, Summer.*

MEULDERS, D. (1974) Coûts et avantages sociaux des dépenses d'enseignement: Un example belge, *Cahiers Economiques de Bruxelles*, No. 2.

MINCER, J. (1974) *Schooling, Experience and Earnings* (NBER).

OECD (1971) *Occupational and Educational Structures of the Labour Force and Economic Development* (Paris, OECD).

PANDIT, H. N. (1976) Investment in Indian education: size, sources and effectiveness, *IIEP Occasional Paper No. 43.*

POURHOSSEINI, M. (1979) The social and private rates of return to investment in education in Iran, *NEP Research Paper No. 89* (University of Birmingham).

PSACHAROPOULOS, G. (1973) *Returns to Education: an International Comparison* (Jossey-Bass, Elsevier).

PSACHAROPOULOS, G. (1976) Earnings determinants in a mixed labour market, in VAN RIJCKEGHEM, W. (Ed.), *Employment Problems and Policies in Developing Countries: the case of Morocco* (Rotterdam University Press).

PSACHAROPOULOS, G. (1975) *Earnings and Education in OECD Countries*, (Paris, OECD).

PSACHAROPOULOS, G. (1977a) Schooling, experience and earnings: the case of an LDC, *Journal of Development Economics*, pp. 39–48.

PSACHAROPOULOS, G. (1977b) Family background, education and achievement, *British Journal of Sociology*, September.

PSACHAROPOULOS, G. (1978) Labour market duality and income distribution: the case of the U.K., in KRELLE, W. & SHORROCKS, A. (Eds), *Personal Income Distribution* (Amsterdam, North-Holland).

PSACHAROPOULOS, G. (1979) On the weak versus the strong version of the screening hypothesis, *Economic Letters.*

PSACHAROPOULOS, G. (1980a) *Unpublished Estimates using the 1970 Brazilian 1 percent Census Tape* (London School of Economics).

PSACHAROPOULOS, G. (1980b) Educational planning and the labour market, *European Journal of Education*, 15, pp. 201–220.

PSACHAROPOULOS, G. (1980c) Qualifications and employment at IDS, Sussex, *IDS Bulletin.*

PSACHAROPOULOS, G. (1980d) *Higher Education in Developing Countries: a Cost-Benefit Analysis* (World Bank, Education Department).

PSACHAROPOULOS, G. (1980e) Spending on education in an era of economic stress, *Journal of Educational Finance.*

PSACHAROPOULOS, G. & HINCHLIFFE, K. (1972) Further evidence on the elasticity of substitution among different types of educated labour, *Journal of Political Economy.*

PSACHAROPOULOS, G. & KAZAMIAS, A. (1978) *Report of the Post-Secondary Education Study Team*, (Greek Ministry of Education, in Greek).

PSACHAROPOULOS, G. & LAYARD, R. (1979) Human capital and earnings: British evidence and a critique, *Review of Economic Studies*, July.

PSACHAROPOULOS, G. & TINBERGEN, J. (1978) On the explanation of schooling occupation and earnings: some alternative path analyses, *De Economist*, Vol. 126, No. 4.

QUINTAS, J. R. & SANMARTIN, J. (1978) Aspectos economicos de la education, *Informaçion Comercial Española*, May.

RIBOUD, M. (1975) An analysis of the income distribution in France, paper presented at the *Workshop on the Economics of Education*, London School of Economics.

SCHULTZ, T. W. (1961) Investment in human capital, *American Economic Review*, March.

SCULLY, G. W. (1979) *Economic development, income and wealth inequality*, Southern Methodist University (mimeo).

SMITH, J. P. & WELCH, F. (1978) The overeducated American? A review article, *Paper P-6253*, The Rand Corporation.

STROUP, R. H. & HARGROVE, M. M. (1969) Earnings and education in rural South Vietnam, *Journal of Human Resources*, Spring.

STRUMILIN, S. G. (1929) The economic significance of national education, *The Planned Economy*, reprinted in UNESCO, *Readings in the Economics of Education*, 1968.

THUROW, L. & LUCAS, R. (1972) *The American Distribution of Income: a Structural Problem* (Joint Economic Committee, U.S. Congress).

TINBERGEN, J. (1975) *Income Distribution: Analysis and Policies* (Amsterdam, North-Holland).
TINBERGEN, J. & PSACHAROPOULOS, G. (1980) *Long Range Educational Perspectives in OECD Countries*, mimeo (Paris, OECD).
THOMAS, H. (1976) Labour markets and educational planning in Yugoslavia, *Economic Analysis and Workers' Management*, Vol. 10, No. 1–2.
ULLMAN, C. (1972) The growth of professional occupations in the American labour force, 1900–1963, *unpublished PhD dissertation.* Columbia University.
UMETANI, S. (1977) The college labour market and the rate of return to higher education in Postwar Japan, 1954–1973, *unpublished PhD dissertation*, University of Wisconsin-Madison.
WELCH, F. (1970) Education in production, *Journal of Political Economy.*
YOUNG, K. H. & JAMISON, D. (1975) The effects of schooling and literacy on earnings, paper presented at the *3rd World Congress of the Econometric Society*, Toronto.