THE TREATMENT OF EDUCATION IN
NATIONAL ACCOUNTING[1]

BY DUDLEY SEERS
AND RICHARD JOLLY

It is argued that the conventions of an accounting system, such as the S.N.A., are a matter of convenience. The treatment of education as a current expenditure, instead of as a form of capital formation, derives from the Keynesian system, and is not appropriate for dynamic problems of developing countries, where weaknesses in education are often the main "bottleneck" in the process of development. In such countries, expenditure on education clearly yields its benefits mainly in the longer run. To treat this as a consumption item biases policy in the direction of using financial resources for fixed capital rather than human investment, and may cause aid agencies to penalize countries which expand their educational systems. A similar problem arises on other expenditures such as health, but the case for treating them as investment is not so strong.

To treat educational expenditure as part of capital formation logically requires two major changes. First education needs to be removed from private and public consumption, and for this purpose a fairly broad definition of what is education should be used. Secondly, the stock of educational capital should be valued. The valuation problems are, however, severe. Variations in cost components make historic cost of little value as a yardstick, and calculations of future returns are fraught with difficulties. Using replacement costs, which seems the best method, involves the construction of education profiles in physical terms which can then be valued by present or by standardised costs. The depreciation of human capital through mortality and retirement can be allowed for by applying national average rates to these physical profiles.

Switching educational expenditure from current to capital accounts involves no serious practical problem. However, although there should logically be an allowance for depreciation on human capital, this is not recommended; single monetary measures of educational stock are not very meaningful, and this would involve changing the definition of "net" aggregates. Development of statistics of educational stocks and flows in physical terms—the beginnings of "demographic accounting" fully integrated with the rest of national accounting—is strongly advocated.

I. *The Basic Issue of Principle*

The main point to keep firmly in the forefront of one's mind in any discussion of accounting problems is that systems of accounts are highly artificial. The

accounts chosen and the items selected reflect a view on the way in which economies operate and a number of judgments on the relationships worth studying, as well as a number of assessments of what can be quantified. Other views, other judgments and other assessments naturally lead to different systems.

Although this point is obvious, it is worth stressing, because once a set of accounts has been frozen into a "standard" system it develops a degree of sanctity (just as, say, Euclidean geometry did). We forget that it is a matter of convenience. There is, of course, much to be said for *not* changing a "standard" system, such as SNA. A change involves a great deal of work in revision (or serious loss of comparability). But this can be exaggerated. A new breed of Fundamentalists treat the conventional accounts more as tablets than tables. The question is whether the effort involved in any change is worthwhile, and we should not lose sight of the fact that we are, by historical standards, still at the very birth of national accounting—as indeed of economics.

It is always difficult to see the arbitrary nature of decisions if one has been brought up and worked in the same environment as those who have made them. They seem "obvious", "universally valid", etc. A critic has to go back to the origins, and examine why those creating (e.g.) an accounting system shaped it the way they did. What we now call the "standard" system, the SNA, was produced by people of Anglo-Saxon culture to quantify Keynesian economics. The prototypes were, in fact, prepared by Colin Clark and others working under Keynes' direct personal influence, to illustrate first the operation of the multiplier and later "how to pay for the war".[2] Naturally, this system appears broadly the right one to people who have had a similar upbringing and experience (we are in a sense all Keynesians now). But one might easily make different decisions on the key issues. The great merit of a number of the contributions of Professor Kuznets was to show that, with an alternative set of judgements, one arrived at a different system of accounts.[3]

There is, after all, no reason *a priori* to expect that what is an appropriate instrument for analysing American economic problems will also be the most suitable one for (e.g.) Antigua, Algeria and Argentina. Several features of the SNA are in fact wrong for use in *most* economies. It is—like Keynesian economics—too aggregative, excessively demand-oriented and too "closed" a system. We shall not pursue these aspects here. Our point in this paper is that the way investment is treated is no longer suitable, since it reflects another weakness (from today's viewpoint) in Keynesian economics, that it is fundamentally static.

Keynes was much more interested in the income-generating consequences of investment than in its effects on the stock of capital. Even his conception of capital was basically a short-term one, in the sense that he was mainly concerned with the danger of a growing stock depressing yields, discouraging invest-

2. The name of Erwin Rothbarth should be better known as one of the originators of the present type of accounting. It should also not be forgotten that a similar system was being developed independently by economic statisticians elsewhere, especially in Norway and the Netherlands.

3. The novel feature of Professor Kuznets' system was that Government (and some other) services were treated as intermediate products, which is strictly a heresy in the Anglo-Saxon culture. Marxists treat nearly all services in this way, and reach still another system.

ment and starting or strengthening a recession. The distinctive feature of business "investment" from the point of view of Keynes' system is that it is postponable, provided the economy is operating below capacity.[4]

"Investment" in this sense could be measured fairly closely by the category which was operationally easiest, i.e., whatever expenses tax authorities forbid an enterprise to charge fully as a cost against the current year's income.[5] The corollary was that expenditures by consumers were all "current", even if they referred to the purchases of durable goods, though an exception was made, the logic of which was never quite clear, for housing. In principle, government capital formation consisted of outlays on goods which would have been treated as investment if they had been privately purchased.

The reader may ask: why did not the emergence of dynamic economics after the war cause the reconstruction of SNA—if an accounting system is really the by-product of economic theory? This might have been expected, especially in the treatment of "investment", since the neo-Keynesians (Harrod, Domar, Mrs. Robinson, etc.) looked on this primarily as a source of long-term increases in output. Yet as we know SNA survived the change. The reason is that non-deductible expenditures are in fact the major determinants of long-term growth *in a developed economy*.

This is the heart of the matter. For the purpose of analysing growth over a decade or so in a developed society, it is not entirely implausible to argue that we can ignore the technical level of the human population. The stock of skills does not change very much in that time. In fact, in a country with a stationary population showing a gently sloping age-profile, and where the structure of the educational system was unchanged and the same syllabus was always taught, the educational stock would be constant. In developed countries, the population growth *has* been fairly slow; primary education has been universal for several decades and the average duration of schooling has lengthened only gradually; and curricula have not altered so very much (not enough, in the view of many!). Thus, for many decades, the average level of educational attainment has risen relatively slowly.

In underdeveloped countries, however, especially in tropical Africa, demographic and educational history have produced a situation in which the addition to the educational stock each year is many times as great as the loss through death and retirement, and the net annual gain is a sizeable proportion of the existing stock. Education is therefore a major determinant of growth, even over a period as short as a decade. Moreover, one of the characteristics of an underdeveloped country is that the educational stock is low in relation even to current levels of economic development, so that full use is not made of fixed capital.

4. Another necessary characteristic is that expenditure on any capital good is not directly reflected in the price of the product it helps to make. Otherwise a fall in investment would be reflected in a price decline, and an excess of savings would not tend to arise.

5. It does not, incidentally, seem to have been generally appreciated that the coverage of investment, on this definition, depends on the time period concerned. While it is not wildly implausible to treat hand tools and office furniture as inputs to the economic process of the *year* in which they are bought, as is common practice, it would be an outrageous libel on manufacturers to pretend that they can legitimately be written off in the *month* of purchase.

For example, hospitals cannot operate fully because of lack of doctors, factories run at less than capacity for lack of artisans, and the general scarcity of competent administrators means low efficiency in both the public and private sectors.

In such circumstances where weaknesses in education can be the main "bottleneck" in the growth process, the Harrod-Domar model is obviously not useful, and may easily be very misleading. In many parts of tropical Africa, output in 1980 will depend to a large degree on how much education (and what sort of education) is provided in the meantime. National incomes could be doubled in some countries in the next fifteen years with only limited addition to fixed capital, by improving agricultural techniques and increasing professional services. But one could not imagine this rate of economic growth being attained without big increases in the stock of educated manpower (at all levels), however much fixed capital is installed. Indeed, without many more engineers, architects, etc., it will be very difficult to achieve a big increase in the stock of fixed capital.[6]

We cite tropical Africa, especially East and Central Africa, because this is where the economist really has to face up to the role of education in building the skills and attitudes needed for economic growth, and in making possible more efficient forms of economic and social organisation. Data on fixed capital formation are often less interesting to him than data on educational expansion. Indeed, some combination of expenditures on both these items in relation to the gross domestic product is needed as a measure of the extent to which a society is sacrificing current advantages for the sake of the future.

But we would not confine our remarks to this region. In Asia and Latin America, particularly in some parts (e.g. Central America), it is being increasingly recognized that the role of education is of comparable importance to fixed-capital formation. Moreover, in the developed countries, too, the economic significance of education is becoming appreciated, now that supplies of certain skills are proving inadequate. An impressive number of quantitative studies in recent years on the productive returns of education have sharply swung economic opinion in these countries to consider human capital as part of economic capital. Although there are many serious technical difficulties in measuring education's contribution to economic growth, it is becoming widely accepted among economists that education has been and will remain a major factor in raising productivity and national output.[7]

The conventional treatment of education in national accounts as a consumption item[8] must have contributed to its earlier neglect by academic

6. This needs to be qualified. These countries need *experienced* professional staff, which have to be in part imported from abroad. (A weakness of most practical measures of educational stock is that they do not take account of the further improvement in a man's ability after his formal education has ceased.)

7. An excellent summary and appraisal of the various approaches is given in W. G. Bowen, "Assessing the Economic Contribution of Education: an appraisal of alternative approaches", in *Higher Education. Report of the Committee under the Chairmanship of Lord Robbins 1961–63* (London: Her Majesty's Stationery Office 1963), Appendix 4, pp. 73–96. But see particularly studies by Becker, Denison, Kendrick, Schultz and Solow, referred to in Bowen's article.

8. Professor Ruggles has pointed out to us that the conventional treatment, restricting "investment" to material investment, is really in line with Marxist conventions rather than those used in national accounts in capitalist economies.

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economists, compared to other types of investment.[9] The present conventions have had very real practical disadvantages as well, which can be illustrated by two examples. First, in spite of the growing agreement that human capital is as important as its physical counterpart (if not more so), planning models often given predominant emphasis to physical capital-output ratios. The bias is reinforced by a tendency to exclude educational expenditure from the "development budget". Not surprisingly, policy has been affected in consequence. Some development agencies, for example, have been slow in financing educational investment, despite its very high potential yield, or else have concentrated their assistance on the construction of buildings (encouraging the practice of making them too big and too elaborate in relation to the total educational program).[10]

Secondly, one criterion of "self-help" used by governments dispensing aid is the marginal propensity to save. In estimating this, if saving is defined on current conventions, no account is taken of the growth of expenditures on human capital formation. Consequently, a country which (probably correctly) gives a priority to this type of investment is penalised.

Many will still hesitate before taking such a drastic step as to reconstruct a system of national accounts. It can after all be argued that education is not only a form of long-term economic investment. The current returns from educational expenditures are, to put it at its lowest, that children are being looked after and the mother's life correspondingly relieved. In addition, learning is not a wholly unpleasant process, especially for older children and adults, and many adults value the education they have received for its own sake quite apart from any economic benefit. As became clear in the controversy between Schultz and Schaeffer,[11] the "psychic returns" of human happiness which education can inspire last long after one has left school. (Some might say, *only* after one has left school!) Similarly, communities and nations often place a high value on education as a way of satisfying the need for prestige (apart from the higher status brought by education through its contribution to economic advance).

Education is, moreover, only one example of expenditures commonly classified as current consumption, but which give rise to substantial future benefits, economic or "psychic". Health and, at low income levels, even food expenditures are others. Indeed, the lower the economic level of a community the greater the probability that any "consumption expenditure" on people will also raise human productive capacity. At the same time the poorer the consumer, the shorter his foresight. Both these tendencies mean that at low income levels there are many

9. There are several other explanations for the delay in appreciating this. One is the lingering, though now archaic, belief that the main purpose of education is to improve human beings in some non-economic sense—for example to make them gentlemen or to integrate them into American society. Another is a primitive faith in the concrete and visible. A fixed asset can be photographed and shown to visitors; in the last resort it can be sold. Improvement of the mind, on the other hand, can only be manifest in a framed certificate.

10. Educational buildings are formally similar to factories in the capital goods sector— i.e. capital for producing capital.

11. T. W. Schultz, "Investment in Human Capital", *American Economic Review*, March, 1961, pp. 1–17, and the comment by H. Schaeffer, in the same journal, December, 1961, pp. 1026–35.

types of expenditure which have both "consumption" and "investment" features, and there will be an important area of overlap between what is consumption from a Keynesian point of view and what is investment by the test of growth.

The decision on what should be counted as "investment" is a matter of judgment. The significant feature of educational expenditure, however, is that its benefits are felt almost entirely *after* the year in which it is incurred, and for several decades thereafter. Its economic effect is also much more obvious than that of health, nutrition, etc., even though it is true that ill-health or under-nourishment may prevent the economy gaining the full benefit from investment in human skills. Consequently, it seems that, at this stage, the best procedure is to limit human investment to educational expenditures. The case for including research expenditures is also strong, but this is outside the scope of the present paper.

The change of treatment suggested here is not in fact as revolutionary as it may seem. It would be consistent with one of the U.N. Statistical Commission's proposals for the revision of SNA.[12] This report suggests treating consumer expenditures on "major durables" (such as cars, furniture, household appliances and radio and television receivers) as capital formation, on the grounds that the benefit lasts significantly beyond the year of purchase (even though this benefit is purely "psychic").

It is true that the current conventions are simple and workable, but there comes a point when it is better to use a good definition—even with some difficulties and ambiguities—than to use an inappropriate definition simply because it is easy. This point has surely now been reached. In spite of the difficulties, it will be nearer the truth to class educational expenditures under investment than to ignore all human capital formation.

Naturally, analogous changes will be required in the definition of "consumption". Consumption plus investment will only equal income if both consumption and investment are defined by consistent criteria.[13] For the reasons given earlier in this paper, accounting concepts should be selected so that they serve the major purposes of economic policy. When the primary purpose is growth rather than the maintenance of effective demand, consumption like investment should be defined in terms of growth criteria.

Another corollary is that "capital" should be redefined to include the stock of educational manpower. This is logically necessary, but it raises severe difficulties, which will be discussed in the next section. It will be argued that the two issues can in practice be separated.

12. "A System of National Accounts" (Proposal for the Revision of SNA, 1952), E/CN 3/320 (9th February, 1965). The paper's tables do not, however, follow the text in this respect.

13. It would be strictly possible to preserve this fundamental identity in terms of (growth) investment and (Keynesian) consumption by re-defining income. Indeed, one interpretation of the different definitions of investment is that certain investment expenditures produce immediate consumer satisfactions not measured by the usual definitions of income. But although such a redefinition is theoretically possible, it is practically undesirable, because it would violate the fundamental need to keep accounting in touch with actual expenditures. We are grateful for Mr. G. K. Helleiner, formerly of Yale University, for drawing our attention to this point.

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These introductory remarks would be incomplete without a warning on the very great variation in the economic usefulness of different *types* of educational investment, so that totals of spending are of limited value. In fact the formation of potential clerks (or potential Keynesian economists!) may actually be counter-productive in some economies.

II. *Statistical Problems*

A decision to include education expenditure as part of capital formation would logically require two major changes: educational expenditure would need to be shifted in the national accounts from the consumption to the capital account, and some measure of the stock of educational capital would have to be devised.

(i) *Educational expenditure*

To include the *flow* of expenditure on education within investment would raise a few, not very serious, difficulties. The first problem is where to draw the line between what is "education" and what is not. The various workshops on budget reclassification held by the United Nations have produced reasonable guidelines for the treatment of expenditure outside the field of formal education,[14] such as expenditures on adult education, agricultural and medical training (which are included in educational outlays) and military training and schools for the disabled (which are classified elsewhere).

In addition to formulating a workable definition of education, we need to decide what types of education to include within investment and what forms, if any, to exclude. Here our own preference is for a wide rather than narrow coverage. Sir Arthur Lewis has suggested that only secondary and higher education should be classified as investment, and education at lower levels should be treated as consumption. A different solution has been proposed in Ceylon, to include in investment only those forms of education which are generally agreed to be needed for the country's further progress at its particular stage of development, which implies that the coverage of educational investment would shift as development proceeds. The point is debatable. Our argument for including *all* education is simply this: considering the long horizons over which returns must be judged and the absence of precise evidence, it is probably better not to attempt too fine a line in making distinctions. Moreover, some part at least of the lower levels of education must be included since they are an indispensable preparation for the higher levels.

The element of debate in classification strengthens the case for dividing the broad category of investment into a number of sub-categories, as has been suggested by Professor Ruggles. A more detailed breakdown of the different forms of investment—investment in machinery and physical plant, investment in housing, investment in consumer durables, investment in human capital by educa-cation and so forth—would have the obvious advantage of making clear the

14. E.g., "Manual for Economic and Functional Classification of Government Trans-actions" (United Nations, New York 1958).

variety of items included within investment as well as allowing those using the tables to include or exclude items as best served their particular purposes.[15]

(ii) Educational capital

We can group the statistical difficulties here under the headings of (a) problems of valuation and (b) problems of measuring capacity, scrapping and obsolescence.

(a) Valuation

The basic problem in valuation is whether to measure the cost of the educational capital in terms of historic cost, replacement cost or future returns. There are difficulties associated with each of these three measures.

The difficulty in using historical cost can be made clear by distinguishing the key components of any total of education expenditure (C). Broadly speaking, this covers expenditure on buildings and teachers. Capital expenditure largely goes on school buildings, with a small amount on equipment. Recurrent expenditure largely goes on teachers' salaries, with (at lower levels) a fifth or less on other items. Because the teacher's salary bill is simply the average salary times the number of teachers, the main components of educational expenditure can be represented by the following two equations:

$$C = C(K) + C(R) \quad \text{.............................} \quad \text{(i)}$$
$$C(R) = P.t.W. \ (1 + k) \quad \text{.........................} \quad \text{(ii)}$$

Where: $C(K)$ = "capital" expenditure on education
$C(R)$ = "recurrent" expenditure on education
P = number of pupils enrolled
t = average number of teachers per pupil
W = average teacher's salary
k = proportion of non-salary expenditure to total salaries.

Considerable variations in both capital and recurrent expenditure on education are possible without making any significant changes in the volume of educational activity (as measured by some physical indicator). As regards capital expenditure, this is mainly because $C(K)$ measures only expenditures on new educational buildings and equipment or on maintenance of the old, and

15. There is the additional question as to whether some estimate of the opportunity costs of the students should be included within the flow of investment expenditure on education. Whilst in principle there are good reasons for this, there are several major accounting objections. In the first place, it would introduce a *large* item of imputed expenditures, much larger than the imputations for bank services (for example) at a time when the tendency in revising the SNA is against imputations. In the second place, it would violate the established convention that housework and other unpaid family services, though often involving an opportunity cost, are not imputed. Furthermore, in developing countries where underemployment and unemployment are widespread, there are immense practical and theoretical difficulties in imputing opportunity costs for labour. Our own view, is that for policy making purposes the opportunity costs of the students' labour, as indeed of house-wives' time, are best taken account of in some form of national manpower budget, as part of the demographic account, showing in physical terms how the nation's human resources are deployed.

thus refers to an *increment* rather than to the *stock* of educational facilities. But in addition, variations in the standards of construction and intensity of use (as well as economies of scale) can produce large differences in unit costs which have little, if any, connection with the quantity or quality of the education offered.

Recurrent expenditure is, for similar reasons, a poor indicator of the level of current educational activity. Variations in either t, W, or k can cause the costs of the educational system to change without any change in measurable output. In other words, any monetary measure of the stock of educational capital, if based on historical costs, will reflect variations in the cost components of the educational system, even though many, if not most, of these variations are totally unrelated to the quality and quantity of education produced.

Although variations in cost components also affect valuations of fixed capital, the problem is much less serious. This is partly because both the gestation period and the period of return are very much shorter for physical capital than for human. Even for an individual, the gestation period for investment in a full education may be fifteen or twenty years. The period over which the current stock of human capital of a country has accumulated will be fifty years or more. For the community as well as the individual the period of return is as long as human working life. Over such long periods, variations in the cost components can be very considerable.

Another reason why variations in the cost components of human capital are often larger and less meaningful than for physical capital is that the incentives for minimizing costs are generally weaker. Most education, for instance, is organised on a non-profit making basis and there are usually a hundred and one other objectives which educational authorities seek to achieve before minimizing cost per student. (In part, this simply reflects the difficulty of measuring educational output in a way which takes account of quality.) But whatever the reason, the result is a wide range of variation in the cost components of education, both between countries and also within a country over the decades in which the existing stock of human capital is formed.

An example from Uganda illustrates this point. Table I shows the changes in the cost components of primary education from 1938 to 1958, when educational expenditure in total rose nearly forty times. Over this period, the output of education, judged by total enrolments, rose nearly seven times and average salaries nearly eight times, while the teacher-pupil ratio decreased by a quarter.[16] In other words, if the growth in expenditure were used as a measure of the growth of educational output, the latter would be overstated, nearly six-fold. If, on the other hand, a simple deflator were used to eliminate the effect of the increase in teachers' salaries, the real change in educational output would be understated.

Although wage structures are always unstable, changes in them are particularly big in underdeveloped countries, where markets are highly imperfect. The wage structure can be so divorced from the economic forces that the wage bill

16. Although a price index is not available for the whole period, the increase in real salaries was certainly very considerable, probably rising about 2½ times from 1949 to 1958.

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TABLE 1

ANALYSIS OF INCREASES IN RECURRENT EXPENDITURE ON
AFRICAN PRIMARY EDUCATION IN UGANDA 1938-58

	1938–49	1949–58	1938–58
Number of times increase in:—			
$C(R)$—recorded recurrent expenditure	4.1	9.7	39.6
P —pupils enrolled	3.2	2.1	6.7
t —teacher-pupil ratio	.87	.88	.76
W —average teacher's salary	1.6	4.9	7.8

Source: A. R. Jolly, *"Planning Education for African Development"* (in press, East Africa Publishing House). Ch. III, Table XVI.

is a very poor guide to the opportunity costs of manpower.[17] In these circumstances W is a very arbitrary measure of the labour input into education, let alone of educational output.

For many of the same reasons, any attempt to measure educational capital by its future returns is fraught with difficulties. Besides variations in cost components and imperfections in the labour market, difficulties arise because present wage and salary levels in various occupations are imperfect indicators of the *future social* returns to education. It is obviously not satisfactory to measure educational capital by its future returns in the absence of precise knowledge about the quantitative relationship between education and its returns. Clearly many factors are ignored if the whole correlation between educational stock and economic growth is attributed to the effects of education on growth. But if not all, how much? In any case, a prime purpose of creating measures of educational capital is to measure their effects on growth, and one can hardly begin by defining one in terms of the other.

The rejection of measurements based on historical cost and future returns leads us to prefer measures based on replacement cost.

This approach resolves itself into choosing a consistent and comprehensive *physical* measure of human capital which can then, as a second step, be valued under some set of prices. The elements of this approach can be illustrated by reference to the diagram below, which represents the stock of educational capital in a country (Uganda) as an "educational profile" of the indigenous population. The horizontal axis measures the ages of the present population; the vertical

17. H. A. Turner, *"Wage Trends, Wage Policies and Collective Bargaining: the problem for under-developed countries"* (Occasional Papers 6, Department of Applied Economics, Cambridge University 1965) has collected a good deal of evidence on this subject which suggests that this generalisation probably applies to many developing countries in recent years. Studies of individual countries also suggest that increases in wages and salaries often occur in spite of market forces rather than because of them:—
e.g., J. E. Meade, "Mauritius, a case study in Malthusian Economics", *Economic Journal*, No. 283 Vol. LXXI, September 1961, pp. 521–534.

L. G. Reynolds, "Wages and Employment in a Labour-Surplus Economy", *American Economic Review*, Vol. LV No. 1, March 1965, pp. 19–39.

Dudley Seers, "The Mechanism of an Open Petroleum Economy", *Social and Economic Studies*, March 1964.

UGANDA-EDUCATION PROFILE OF AFRICAN POPULATION
(Total Population)
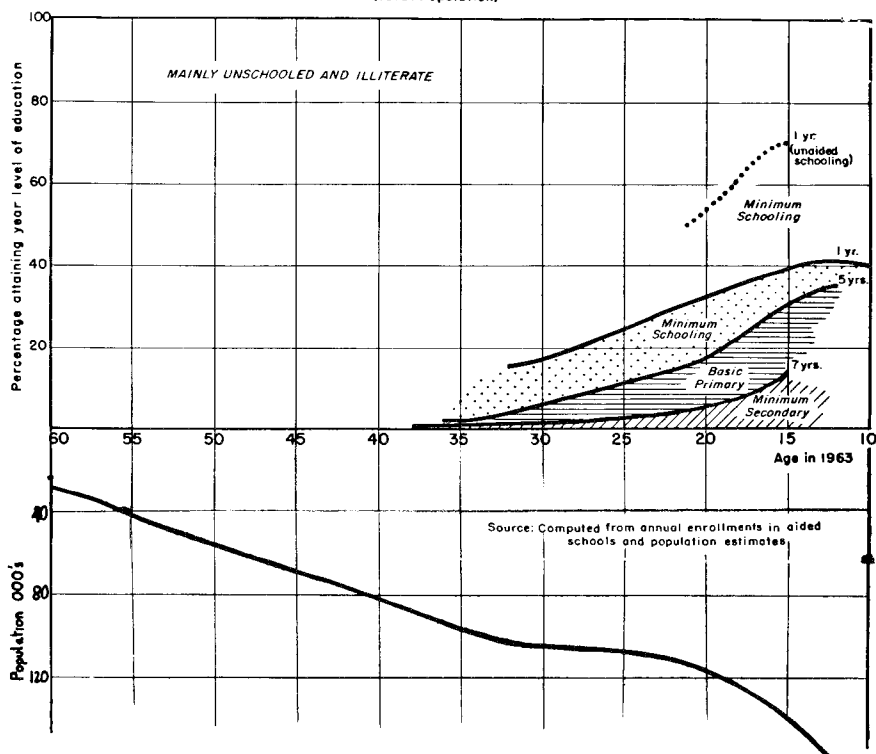
axis measures the percentage of each age cohort who have attained each level
of education (measured in number of years). Because there is usually some
continuity in a national educational system from one year to the next, the educa-
tional profiles of most countries will generally reveal continuous contours for
each educational level, as shown in the example given. Furthermore, since the
proportion at younger ages reaching any given level of education will usually be
higher than in the older age groups, the contours will generally slope upwards,
as shown.

This educational profile simply shows the *proportion* of each age group
attaining each level of education. The *numbers* of persons in the stock of human
capital can be derived by applying the educational breakdown for each age group
to the numbers of persons in the corresponding population cohorts. In other
words, the third axis would be the population profile using the same scale: see
the lower half of the diagram. We need to work of course in *numbers* of people.
The monetary measure of the stock of educational capital would be the unit
cost of each type of education (including opportunity cost) times the numbers
of persons in the stock of human capital with that level and type of education.

For all the reasons mentioned earlier, the unit costs will differ over time
and between countries as widely as the component variables shown in the earlier

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equations. Different wage levels in different countries make international comparisons of the stock of educational capital particularly misleading. One way out might be to choose a standard set of unit costings, which could be applied to the physical measures of capital stock. But this is, in effect, half way between a financial and a physical measure, and often it will be better to make use of direct physical measures.

Problems about the quality of education have so far been ignored, despite their obvious importance. The value of the educational capital to the economy will be greatly affected by its suitability for economic activities and its flexibility to meet changing economic requirements. So the meaning of a number of years of schooling varies widely. For this reason, the standard of schooling reached by a student could be used, rather than the time it took him to reach it. This may in fact be in any case more convenient statistically. But of course it by no means solves the problem of how to allow for differences in quality.

Two major sources of information are available for constructing an educational profile for a particular country. Many censuses contain sufficient information about the educational attainments of the whole population to be used as a measure of the stock of educational capital. With the development of demographic accounting, more comprehensive and consistent data of this sort may be expected. Meanwhile, in countries where census (or sample survey) information is not available, the educational profile of the present population can often be constructed from the records of school enrolments over past years.[18] The technique is broadly as follows: first the trend of school enrolment ratios of the school age population at different periods in the past is calculated, then these are applied to the corresponding age cohorts of the present population. This was the method used in the example given.

It is obviously possible to produce this statistical information in the form of a matrix, and for detailed calculations this would be necessary. At the secondary and higher levels of education, the matrix would need to distinguish different types of education—for instance, technical, commercial, university and so forth.

(b) Capacity, Scrapping and Obsolescence

Human, like fixed, capital may be used at less than full capacity. In most countries, the labour force is largely confined to those above school age and

18. This is, in effect, the application of "perpetual inventory" methods to the field of human capital. It may be worth pointing out that physical measures of the stock of educational capital are in many ways more soundly based than measures of fixed capital. In the first place, a census showing educational attainment among the whole population is really a census of educational capital, providing a physical enumeration of the individual units to an accuracy never achieved—or even achievable—with fixed capital. Secondly, if the perpetual inventory method is used, either to estimate the initial stock or to provide an annual series, the available data on the expected length of life are much more detailed and accurate than for physical capital. Expectations of human life are frequently estimated to two decimal points of a year, a standard far in advance of our knowledge of the average life of fixed capital. Furthermore, annual data on school enrolments (i.e. on physical investment in education) are generally available for much earlier years than are data on investment in fixed capital. Even in those underdeveloped countries where a complete annual series of enrolments is not available, year-to-year continuities in the school system make it possible to estimate the physical stock of education with a fair degree of accuracy.

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below the age of retirement, and it contains a higher proportion of males than females. For many economic purposes, therefore, some adjustment must be made to the total stock of educational capital to allow for that part which is not used. This can be done by using labour force participation rates and applying them to the profile or matrix of educational capital.

Corresponding to the scrapping of fixed capital, there is a gradual wearing away of human capital due to mortality and retirement. This can be illustrated quite conveniently with the aid of the diagram given. The effects of mortality and retirement are to erode the contours of the population profile, particularly near its apex. If mortality and retirement are unrelated to educational level, the contours of the educational profile will be unchanged during this process. If on the other hand, those with more education are—in any age group—less likely to retire or die, the contours of the educational profile shift gradually upwards as the erosion takes place. Although the second assumption seems more plausible, evidence on the point is extremely limited. In any case the effects may well be fairly minor, unless mortality is very high. A reasonable estimate of the depreciation of the stock of educational capital can therefore be obtained by applying national average rates to a profile of educational attainment, in whatever form the latter is available.

More difficult than the problems of retirement and mortality is the treatment of obsolescence, due to the diminishing utility of techniques as time passes, especially in a period of rapid development.[19] This effect raises the problem of measuring educational quality once again. Although it is unsatisfactory not to have more reliable measures of quality, the problem is less serious for a measure of educational capital based on costs than for one based on returns.

III. *Practical Applications*

Let us summarise and draw the conclusions. First, valuation of investment is not an operational problem for those dealing with expenditures (by contrast to the valuation of stock). Actual outlays measure the resources absorbed, and this, rather than the discounted value of returns is the relevant measure (as it is for physical capital formation). Our proposal is simply that education, as currently estimated, should be switched out of private consumption and out of government current expenditure into a new category: human investment. There would be a corresponding increase in the item "saving" in government (and household) current accounts.[20] It may be argued that a rearrangement of numbers is not worth a fuss; anyone who wants to do so can make the changes themselves. We find this unconvincing for a number of reasons. The necessary detail

19. This applies also of course to the statistical techniques one learns at university!
20. The loss (or gain) of educational capital through migration ought in principle to be treated as a capital transfer. Indeed, increasing attention is now being paid to the economics of the brain-drain and, at some point, the results of this work will need to be brought into the framework of national accounting. See for example Grubel, H. G., and Scott, A. D., "The International Flow of Human Capital", *American Economic Review, Papers and Proceedings*, May 1966, and by the same authors, "The Immigration of Scientists and Engineers to the United States 1949–61", *Journal of Political Economy*, August 1966. Another theoretically possible refinement would be to treat health expenditures as the maintenance of educational capital.

is not always, or even usually, provided. Moreover, if it is right that most users in a big majority of countries need to treat education as a type of investment, then the argument can be reversed: the accounts should be arranged for *their* benefit—anyone who wants to go back to the old-fashioned conception of education will be free to do so. Inertia is powerful, and people will, in fact, normally take what they are offered, even if (as we have argued) it leads to mistaken analyses and to distortion of policy.

Secondly, while in principle the accounts should also contain a measure of the depreciation or scrapping of the stock of human capital, the practical difficulties seem overwhelming. It is true that estimates of the rate of depreciation are less inaccurate than for fixed capital, even though in some countries the basic age structure and the mortality and retirement rates may have to be estimated very roughly. But, for the reasons given above, we are far from convinced of the meaningfulness of a single monetary measure of educational stock. Another rather important practical point is that while none of the aggregates is affected by the proposed change of treatment of expenditures, the "net" aggregates would be altered by extending the coverage of depreciation. The new series of "national income" would be inconsistent with the old (causing the obsolescence of a great deal of intellectual capital!). We do not therefore recommend including at present estimates of depreciation of human capital. If, in the future, techniques should develop to the point where these estimates are better based, the point should be reconsidered. It may be argued that "net" aggregates would then be misleading, and that the new system would have a deep logical flaw. But this price seems worth paying. After all, the logic of the basic structure is far from perfect (note the difficulties in the treatment of work one does on one's own behalf), and, for developing countries at least, the "gross" concepts are increasingly replacing the "net" for practical use.

The third and perhaps most important conclusion concerns the development of measures of educational stock in physical terms. For the reasons we have given, these are more meaningful for analysis and policy than a single monetary value of the educational stock. Manpower planning is a rapidly developing field. Both analysts of economic development and planning offices need detailed data on educational stock, related to the data on employment and occupation, and in a form which is directly comparable to the industrial sectors shown in the national accounts. "Demographic accounting" needs to be developed to cover all the flows of manpower, including migration and the output of schools, in order to show uses of manpower (at the different education levels) in a way which can be related to the various sectors of economic activity. We support the proposals that in a Revised System of National Accounts "systems of labor, demographic and other social statistics" should be closely related to, if not integrated with, national accounts and balances.[21] These data are needed, not only as a first step in extending the definition of national wealth to cover human capital, but as a major development in their own right.

21. *Op cit.* p. 12.

Les conventions d'un système comptable tel que le S.C.N., doivent être liées à l'usage auquel il est destiné. Le traitement de l'éducation comme une dépense courante, et non comme une forme de formation de capital, dérive du système keynésien mais ne convient pas aux problèmes dynamiques des pays en voie de développement, où l'insuffisance de l'éducation est souvent le principal goulot d'étranglement dans le processus de croissance. Dans de tels pays, les dépenses pour l'éducation ne portent évidemment leurs principaux fruits qu'après une certaine période. Les traiter comme un élément de la consommation conduit à orienter l'utilisation des ressources financières vers l'investissement en capital fixe plutôt qu'en ressources humaines et entraîne les organismes d'aide à pénaliser les pays qui développent leur système éducatif. Un problème analogue se pose à propos d'autres dépenses comme celles qui concernent la santé, mais les arguments pour les traiter comme une formation de capital ne sont pas si puissants.

Le traitement des dépenses d'éducation comme investissement entraîne logiquement deux changements principaux. En premier lieu il faut les soustraire de la consommation privée et publique ; il convient d'utiliser pour cela une définition large de l'éducation. En second lieu, il faut évaluer le stock de capital d'éducation. Les problèmes que posent cette évaluation sont, il est vrai, ardus. On ne peut guère utiliser les coûts historiques ou les rendements futurs en raison des variations dans les composants du coût. On peut utiliser le coût de remplacement en construisant des profils d'éducation. Il est possible de tenir compte de la dépréciation de capital humain par mortalité ou par retraite en appliquant à ces profils des taux moyens nationaux.

Le transfert des dépenses d'éducation des comptes courants aux comptes de capital ne présente que peu de difficulté pratique. On devrait logiquement inscrire le montant de la dépréciation du capital humain, mais ce traitement n'est pas conseillé ; il n'est en effet pas très significatif de mesurer le stock de capital d'éducation par un seul chiffre monétaire. De plus cela changerait les définitions des agrégats nets. Il est par contre recommandé de développer les statistiques du stock d'éducation en termes physiques, en utilisant les secteurs d'industrie des comptes nationaux.