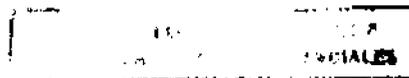


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Refashioning the Concept
of Human Capital
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For the moment, I shall regard education as a mode of economic production, integrating the activities of a set of factors of production. These factors consist of land; capital equipment such as school buildings; the time and effort of teaching staff; and finally the labour power of the 'primary labour unit', the individual being educated. The output is a capital good, a 'machine', which although not neces-
sarily owned by the 'primary labour unit', is indissolubly associated with him in a spatio-temporal sense.

This line of approach is not unfamiliar to economists. One can trace it back at least as far as Marshall; it provides the implicit foundation of a study by Strumilin carried out 40 years ago in the Soviet Union; more recently Schultz has made the approach fashionable amongst American economist (7, 14, 13). I believe that by using the formal model of 'primary labour unit' and 'machine' one can appreciate better both the richness and the limitations of treating education as capital formation. This can be illustrated by examining the subjects of growth theory, student opportunity costs, student finance, and the relation between the rates of return and manpower needs studies of education. An attempt is also made to formulate a criterion for determining the applicability of the capital concept by setting out what have been looked upon as the objectives of education.

The possibilities of incorporating such a model into the theory of economic growth are exciting. In the recent survey of this subject by Hahn and Matthews qualitative changes in the labour force were conspicuously absent (4). This is clearly a great weakness. Labour was measured in terms of its own natural unit and assumed homogeneous. Once we regard education (and health measures) as industries producing capital goods, the possibility of grafting qualitative change of the labour force onto the body of growth theory should be a fairly painless operation. But if education were to be regarded as no more than an additional sector in an n-sector model, no additional element of realism would in fact be achieved. However, the particular "machines" in question do have special characteristics which will change the nature of our growth models considerably, and to the good.

In the first place, the size of the capital stock of the economy will become a direct function of the size and mortality rate of the labour force. We can regard the education 'machines' as one-hoss shays, collapsing on the death of the respective 'primary labour unit'; alternatively if we are of a theological bent, we can consider both as consigned to a more fiery or aethereal region.

Anticipating a later result, (see below), it is inappropriate to regard the entire education sector as capital-forming. Suppose that in general, total Government expenditure is fixed and that the outlay on investment in human capital is a residual, since outlays on non-investment activities must be satisfied first. Assuming that these latter expenses are devoted to the health and education of the

0-14 population, an interesting result follows. Gross investment will be a function of the age-distribution of the population, which itself is a function of the age-specific mortality and fertility rates. For instance, compare three of Lotka's 'stable' populations, 1, 2 and 3 (15). In the first, life expectancy at birth is 65 years, and the rate of growth of population 0% per annum; in the second, 27 years and 0% growth rate; in the third 65 years and a 2% growth rate. In the three economies, the proportion of the population below 15 years of age will be, respectively, 21.8%, 34%, and 35.5%. That is to say, education investment will be directly related to life expectancy, and inversely related to the fertility rate.

If we regard the stock of capital possessed by graduates of the education system as specific to the industry and techniques for which they have been trained, another interesting result follows. We can no longer accept the usual assumption of costless labour transfers. For now, the movement of labour from one industry to another or the change-over from one technique to another will lead to a reduction in the utilized capital stock. This, I am sure, can be formulated in a fairly simple fashion and will add a whole new dimension of realism to our analysis. This is particularly the case when we understand that in the general run of things workers own their 'machines' and derive an income from them.^{1/} So inter-industry and intra-industry transfers will involve a fall in worker incomes, and presumably a rise in the so-called marginal efficiency of capital. We seem to be coming closer to recognizing the maligned wisdom of Ned Ludd.

Finally, on the subject of economic growth, it may be instructive to compare this model with the treatment of technical progress in growth theory.^{2/} In either case there is an improvement in the efficiency of labour. In particular, the parallel seems very close with Harrod-neutral technical progress and Arrow's learning by experience, since in the former case a constant labour force increases in terms of efficiency units, and in the latter case the learning process of the labour force leads to the design of more efficient machines in the new generation. However, the initial similarities are, (I am glad to say!), illusory. The present set of technical progress models may be divided into two classes: manna-from-heaven states^{3/} and learning by experience. The vintage approach is merely a sub-set of each class defining the applicability of progress to new investments; the Kaldor-Mirrlees technical progress function combines the two classes. Clearly the parallel with models of the manna-from-heaven type is non-existent since such technical progress and improvement in labour efficiency is determined exogenously, which is not true of my model. Nor is there a parallel with learning by experience as this increases with gross investment (in Arrow's model) irrespective of the

^{1/} Workers and entrepreneurs own 'machines'. Capitalists and the State own machines.

^{2/} In this paragraph I have drawn heavily on the survey by Hahn and Matthews already quoted which contains a full bibliography (4, pp. 825-853).

^{3/} I much prefer the metaphor of Immaculate Conception - machine goods miraculously impregnated with the Holy Spirit of Progress.

composition of investment. The advantages of the new model is that it makes qualitative changes in the labour force a function of human decisions; enables us to draw fully on the models of growth already in vogue since it is in terms of capital investment; and yet because of the trick of spatio-temporal dependence of 'machine' on 'primary labour unit' it becomes essential to employ parameters such as those of demographics.

Let me now turn to the question of opportunity cost and educational finance. Once it is recognized that the individual being educated is the 'primary labour unit', just one of a series of production factors, then it seems established that the factor has a right to a wage. Since the wage is in the majority of cases either unpaid or under-paid, then in the calculation of education costs it is necessary to proceed on the basis of the highest income available to the factor were he working outside the education sector. Vaizey's objection to the inclusion of student opportunity costs in education costs seems to make as much sense as ignoring the labour costs of any branch of economic activity simply because, for one reason or another, wages were not paid (16, pp. 42-43). The fact that the national income accounts do ignore implicit factor incomes such as those of housewives and voluntary workers seems besides the point. This analysis also indicates that to regard student scholarships as transfer incomes is quite mistaken.

So it becomes important to distinguish between two conceptually distinct elements in discussing student finance. In England at the moment I suppose the popular view is that a university undergraduate is supported by the State until at the end of his three years, he goes out into the world to work for a living with a very useful qualification in his pocket. But if I am correct the student has a right to a wage payment whilst he is at university, (in England say £500 per annum, or about twice the present full scholarship level). The same fallacy is prevalent in Argentina amongst those who claim university education is "free", even though there are negligibly few student scholarships, and even these are mere pittance. Needless to say, the students recognize the fallacy.

However, I cannot conceive of the rationale of a system which takes into the universities those members of the community already endowed with high intelligence or a wealthy family and then at the end of the course presents them with the free gift of a university education, our 'machine'. For it is clear that at least half the costs of the 'machine' were paid by the tax payer (12). The solution might be for the graduate to buy the 'machine' from the State on graduating, or to 'rent' it by a percentage reduction each week from his future money income. Becker in an elegant essay has described a theoretical framework in which on-the-job trainees pay for the cost of their training ^{4/} (2).

^{4/} It might be held that a zero scholarship level is the means by which a student pays for the 'machine'. This is mistaken since in this case he would be paying only the wage of the 'primary labour unit' (by not receiving it himself).

The most frequent use of the human capital concept is in the calculation of the rates of return on education and the planning of education on the basis of estimated future manpower requirements. Becker has described the former method in considerable detail (3). Briefly, it consists in comparing the time-stream of the costs and benefits of the education process under study. Costs are made up of land, capital, labour, and opportunity costs of student time. The benefit stream is estimated by taking a cross section of a population with ages ranging from graduation age to retirement, and calculating how much greater are the incomes of those who received the education in question, say a university degree, than the incomes of those who left the education sector on completing high school. The two streams, once computed, are usually related by an internal rate of return.

The education planning - manpower needs approach has been beautifully set out by Parnes (9). It consists first in estimating, for say a 15-year period, the structure of manpower inputs by occupation and economic sector, and then setting out how the education system must be adapted to fulfilling those needs in terms of student 'output' broken down by number of years of education and subject of specialization.

With the initial model in mind, it becomes clear how closely related are these two procedures. Both have as their major objective the desire to give a rational framework for public investment decisions in human capital. In the one case the methodology is the calculation of the (social) rate of return from investing in a certain set of 'machines', say engineering skills. In the other case the technical coefficients of production in manpower terms are regarded as fairly rigid, so that given ex ante output trends one can know what 'machines' should be built in order to make such an expansion possible.

This highlights a flaw in an otherwise incisive and convincing analysis of the 'coefficient of ignorance' by Balogh and Streeten (1). First they maul the rate of returns approach partly on the grounds that the intrinsic value of education is ignored, as are all the non-financial benefits accruing to the educated individual and others during and after the education process.

Yet later, quite cheerfully, they propose the adoption of the manpower-needs treatment. This is curious since the two are substitutes and both suffer from the same narrowness in their criteria. This is not to deny that there exists an enormous difference in their techniques.^{5/}

Having drawn attention to the richness of the original model, I shall now turn to its limitations. The model of the 'primary labour unit' and the 'machine' is a word-picture and forms just one element of that set or family of word-pictures known as capital theory. It is because of the fact that word-pictures

^{5/} In another paper I have explored in some detail the innumerable weaknesses of the rate-of-returns approach.

come in families, that the analytical techniques developed so painstakingly over the past two hundred years for the understanding of capital formation can be straightway applied in the economics of education. The real problem is: is this particular word-picture any good? Take two extremes, teaching French grammar to a child of 13 and instructing a skilled worker in the operation of a new type of lathe. Intuitively it seems wholly inappropriate to treat the former as 'machine' -creating investment, whilst it does seem appropriate in the second case. So one sets up a Law.

The Law says: "If and only if it is appropriate to conceive education as a process productive of (human) capital may one analyse education by means of the tools of capital theory". But obviously the term 'appropriate' cries out for explanation. At least two elements go to make up the Definition: that the specifically economic effects of the education process be a sufficient condition for undertaking the necessary expenditures; that the possibility exists of defining and estimating quantitatively the relevant 'output', (just as we can estimate the metal products flowing from a machine-press, the waterflow from an irrigation project, and the fall in transportation costs from a road-building scheme).

The Definition is: "The word-picture is appropriate if and only if such-and-such an education sector's primary function is to provide a direct contribution to the economically productive activity of the country". It must be a primary function otherwise our analyses will have no point, operating in a void. It must be a direct function otherwise it will be impossibly difficult to define the economic 'output' in question.

The objective is of course to provide an empirical criterion for delimiting the range of our work. The fundamental assumptions of our analysis will include at least one value judgement - the answer to the question: "What is education for?"^{6/}

6/ "Oh! Horror", says the economist, "but don't you see I'm a technocrat?". The point is that there is no set of professionals within our society whose expert task it is to frame the value judgements of society, although it is true that philosophers are concerned to analyse those judgements once made. Since facts and the opinions of others affect our decision on what is or is not the value or the point of things, one might therefore set up as a fairly objective criterion for our work as economists the considered judgement of a group of educationists and economists specializing in the collation of such facts and with a real understanding of their fellow-mens feelings on education. But finally, we must be driven back to making the decision ourselves. The disinclination to "resort to philosophical arguments about the value of health and life" (my italics) is illustrated by this remark of Weisbrod in his attempt to justify the treatment and detection of tuberculosis on 'payoff' grounds alone. This is followed by the sinister suggestion that "It is desirable to have further information for estimating capital values for particular population subsets. Thus with respect to the tuberculosis example, if the incidence of the disease were particularly great

It is important to note that the primary functions of education will vary over time, from country to country, and from sector to sector within the rubric 'education'. Thus a disaggregated approach is vital.

Millikan with the needs in mind for a development-oriented population in the poorer countries has defined the primary objective of education as the inculcation of problem-solving and rationally inventive approaches to issues (8).

Vaizey informs us that: "In the U. S. A., for example, it was always a principle of American democracy, and of the reformed religion that was its main impulse, that the people should be well-educated; and this was a movement given an enormous boost after the Civil War by the land-grant colleges. All along, too, American education has had as an important job, the aim of preparing people to earn their livings - hence the importance of agricultural education, for example" (16, p. 56).

Jolly has described the educational aims of the Revolutionary Government of Cuba as three in number (6). Firstly as "one of those items of basic consumption which a government declares it will make universally available, whatever the cost and regardless of return. Marti's dictum, "To be educated in order to be free", may well express all the justification the leaders felt was necessary to defend the high priority they gave to basic education". Secondly, as a form of investment implementing the promises of agricultural reform and industrialization through the training of the necessary engineers, technicians and directors. The third aim "has been directed in support of the new economic system, to strengthen incentives for work and saving, to spread awareness of national needs and intentions, in essence to speak directly and specifically to the individuals who make up the system, in an attempt to win their informed -co-operation and to give their enthusiasm for the task of developing a whole country and 'of building its peoples into a Socialist Nation'".

Finally, Young, satirizing the narrow criteria for judging human worth in the Meritocracy, has written of another society (18, pp.134-136). Equality of opportunity "...should not mean equal opportunity to rise up in the social scale, but equal opportunity for all people, irrespective of their "intelligence", to develop the virtues and talents with which they are endowed, all their capacities for appreciating the beauty and depth of human experience, all their potential for living to the full. The child, every child, is a precious individual, not just a potential functionary of society. The schools should not be tied to the occupational structure, bent on turning out people for the jobs at any particular moment considered im-

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among persons with poor survival and earnings prospects (not caused by the tuberculosis), then capital values reflecting these conditions should be used in determining the return from tuberculosis prevention. To estimate human-capital losses in airplane accidents, above-average earnings prospects should be assumed" (17, p. 435).

portant, but should be devoted to encouraging all human talents, whether or not these are of the kind needed in a scientific world".

These views shed some light, I hope, on the definition of 'appropriateness' of the human capital concept. I shall tentatively formulate four rules of thumb. The model of the 'primary labour unit' and the 'machine' is more likely to be appropriate:

- i) The more growth-anxious is the society.
- ii) In any growth-anxious society the more compatible with growth are the value-orientations of that society.
- iii) For any given society the higher the education sector in question, for example university education rather than primary.
- iv) For any given education sector the poorer the country in question.

A paradigm case for and against the use of the investment treatment would be on-the-job training in Ghana, and primary school in Norway. But even when dealing with the former case we should have to proceed with some care since the 'machine' aspect is likely to be only one of a small set of primary functions. ^{7/}

Many students of education and health economics are Law-breakers; that is, they have used capital techniques under inappropriate circumstances. The punishment is, of course, that their work should be, at least in part, valueless. It is neither the case that all expenditures on the education of adults and children are appropriately treated as investment in human capital, nor is it the case, as Schaeffer suggests, that the technique is never appropriate (11). Nevertheless, what should be a carefully-taken decision has become an idle pre-conception. What should be an openly-made value-judgement, has become a narrow-minded ignorance of the need to judge. If I am right, the Law-breakers have committed a category mistake. Quoting the words of Ryle: "It is not merely an assemblage

^{7/} I shall not here address myself to the problems implicit in the looseness of the term direct, primary function. Resorting to analogy, the soldier in spite of the existence of No-Man's Land knows when he is in friendly and when in enemy territory. In one he gets soup and in the other he gets shot. It is interesting to note that in the U. K. during the continuing controversy on the proposed switch from the present hierarchic secondary school system to a comprehensive system, the discussion centred on the breaking down of class barriers, the weakening of the meritocratic trend of our education system, and the effect on the brightest and dullest pupils. The latter issue was never presented as a threat or boost to national productivity, but simply as a possible cause of change of one of the many human qualities we regard as intrinsically valuable - intellectual competence.

of particular mistakes. It is one big mistake and a mistake of a special kind. It is, namely, a category-mistake" (10, pp. 7-17). They are the myth makers. "A myth is of course not a fairy story. It is the presentation of facts belonging to one category in the idioms appropriate to another".

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