Human Capital: A Theoretical Outline

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The aim of this essay is to convey to the reader the importance of investment in human capital. It shall be assumed that the major factor influencing the level of human capital is the degree of investment in education and training. By referring to a simple model of human capital, we can assess the costs and benefits of such investment. Care must be taken to distinguish between the social rate of return and the private rate of return.

The discussion will also take into account the diminishing marginal rate of return of investment in human capital and capital market imperfections. The distinction between general and specific training and the subsequent consequences to the workers and firm shall also be made. To conclude, brief reference shall be made to other factors that may influence the level of human capital.

Investment in Education

The skills and knowledge embodied in an individual can be defined as human capital. All individuals attain a certain stock of human capital and this level is primarily influenced by education and training. Investment in human capital increases productivity. Adam Smith (1776) was the first to suggest that an educated worker could be likened to an expensive machine. The skills embodied in a person can be "rented out" to employers. The higher the level of skills a person has the higher this "rent" is likely to be. Thus, the expected returns on investment in human capital are a higher level of earnings and greater job satisfaction over one's working lifetime.

Blaug, (1972) summarizes the link between education and earnings by stating that "*the simplest explanation of the universal association between education and earnings across sectors, industries and occupational categories around the world is that the better educated are generally more flexible and more motivated, adapt themselves more easily to changing circumstances, benefit more from work experience and training, act with greater initiative in problem-solving situations, assume supervisory responsibility more quickly and, in short, are more productive than the less educated, even when their education has taught them no specific skills.*"

Investment in human capital may be analyzed a by more "scientific" approach. By comparing the costs and benefits of an educational investment we are able to arrive at some conclusions as to the profitability of investing in education. Consider a simple model of human capital. Assume that a high school graduate is trying to determine whether to go to college. There are two general types of cost. Direct costs include, tuition, fees, books and supplies; the indirect costs of attending college are the foregone earnings of not entering the labor market after high school and the physical costs of studying and being examined. The costs must be compared to the economic benefits of investment in education, in other words, to the enlarged future flow of earnings.

It is important to note that future benefits are worth less to us than the same benefits received today for two reasons. First, people prefer consumption today to consumption tomorrow because uncertainties make future enjoyments problematic. Second, interest can be earned by investing monetary benefits rather than using them for consumption. It is therefore necessary that the net present value (NPV), i.e. the discounted value of a financial sum arising at some future period, of the present and future costs and benefits of a college education be determined as they accrue at different points in time.

The discounting formula for costs and benefits over a number of years can be formulated as follows:

$$V_p = E_0 + E_1(1+i)^{-1} + E_2(1+i)^{-2} + \ldots + E_n(1+i)^{-n}$$

The "E"s represent a stream of net incremental earnings; "n" is the duration of the earnings stream, i.e. expected working life; i is the interest rate. This tells us that the more distant the future earnings the greater the discounting. As with any other investment, educational investment should occur if V_p (the NPV) is greater than zero, as the discounted benefits exceed the discounted costs. Another method used in making the investment decision is to calculate the internal rate of

return, r, and compare it with the interest rate, i. The internal rate of return (IRR) is the discount rate, r, at which the NPV is zero. Hence, the equation becomes

$$V_p = E_0 + E_1(1+r)^{-1} + E_2(1+r)^{-2} + \ldots + E_n(1+r)^{-n} = 0$$

The IRR, r, indicates the maximum rate of interest, i, that would allow investment to break even. If r exceeds the market rate of interest i, then investment is profitable. It is profitable to invest up to point at which i = r.

A number of generalizations and implications can now be made. First, the longer the expected working life, the more likely it is that the NPV of an investment in human capital will be positive, explaining why more young people than old people attend college. It is also a factor that explains the wage differentials between men and women, because female participation rates may be discontinuous on account of leaving the labor force to marry and raise children. Second, the lower the cost of investment in human capital, the larger the number of people who will find such an investment to be profitable.

Thus, the lower the direct and indirect costs of attending college the higher the NPV of a college education, giving another reason why less older people attend college; the indirect costs (opportunity costs) of attending college are greater the older the individual. The larger the college-high school earnings differential, the larger the number of people who will invest in college education. From the countless empirical studies which have estimated the returns on investment in human capital, there appears to be a general consensus that the rate of return (ROR) to an individual of a college education is between 5% and 15% above that of a non-college graduate.

The Social Rate of Return

Up to this point we have considered the rate of return to the individual; the private rate of return (SROR). As with any investment appraisal, all costs and benefits should be included. We must take account of the effects of education on society as a whole; the social rate of return, (SROR). So, "*even if additional education did not raise the lifetime earnings, education might still be an investment from the social point of view.*"

There are certain biases in the estimated rates of return on education. This is because factors such as subsidies which are not paid by the individual are included in the SROR are not included in the PROR. Education benefits society in a number of ways. More educated workers tend to have lower unemployment rates and receive higher wages.

Therefore society benefits by receiving more taxes (as more educated workers tend to work more continuously on average and the tax take from these workers are proportionally higher as they are taxed at higher marginal rates due to higher salaries). More poorly educated workers may also find crime an attractive means of supplementing their lower incomes. Society may benefit from investing in education by paying less for social welfare programmers and crime prevention/law enforcement. The children of more educated parents tend to receive better guidance and grow up in a more desirable environment.

Blaug (1972) concludes that if the SROR exceeds the PROR then more investment in human capital should take place and vice-versa. The SROR also provides us with the rationale that education should be subsidized with public funds. McConnell and Brue (1989) state that "*the size of these public subsidies to education should be determined on the basis of the magnitude of the associated social benefit.*"

Diminishing Returns on Investment

As for other investments the Law of Diminishing Marginal Returns (DMR) applies and the marginal ROR on investments in human capital declines. This is because individuals have a fixed amount of time available to them, and the more years spent in education the less time spent in the workforce. This is analogous to the situation faced by women who may leave the labor force early so as to marry and raise children; there is a shorter period of future earnings. The Law of DMR may also explain why the ROR of an educational investment in Less Developed Countries (LDCs) exceeds that in Developed Countries (DCs) - the diminishing marginal ROR of further investment in human capital in DCs yields less than the essentially "new" investment in human capital in LDCs because further investment in DCs is typically investment in post-graduate courses, whereas investment in

human capital in LDCs is often of the most basic form i.e. primary education. The diminishing RORs are also marginally lower due to the increased direct and indirect costs. Direct costs increase with further investment in education, as additional years of schooling typically cost more. Indirect costs, in the form of foregone earnings, also increase with additional education.

McConnell and Brue (1989) give three reasons why different people invest different amounts in human capital. First, consider two individuals, A and B, with different demand curves for human capital, DA and DB respectively, and a common supply curve, S, indicating that both individuals have the same access and terms to money capital for investment in education. DB is to the right of DA and this may be explained by B having greater natural abilities than A, where individual B can transform a given input of schooling into greater productivity, and hence greater earnings than A. Given the perfectly elastic supply curve of financial capital, individual B will invest in eB years of schooling. B's ROR on investment in education exceeds A's. The earnings differentials between B and A is further widened.

Second, assume A and B are identical in terms of ability. However, their demands for human capital may not be the same due to discrimination. "A" may be black or female, for example, and therefore likely to encounter discrimination which reduces A's chance of transforming their human capital into incremental earnings. A's ROR on the same amount of education as B may be less due to this discrimination. A's demand for human capital is less than B's and this is why A invests less in education (eA) than B (eB). Discrimination in labor markets leads to less investment in education and further wage differentials.

Third, assume that A and B have identical abilities implying DA = DB. But now consider the situation where B obtains more favorable terms on acquiring money capital than A. B's superior credit rating may be explained if B is from a wealthier family than A and therefore has more collateral than A. The effect of this is shown below where SA and SB are A and B's respective supply curves for financial funds i.e. B obtains money capital at a lower rate of interest than A. Going back to the first equation, we find that the lower the rate of interest the greater the ROR. It is therefore rational for B to invest in more years of education (eB) than A (eA).

Capital Market Imperfections

In our above analysis it was assumed that capital markets were perfect. We now consider the more realistic everyday situation facing students, that of imperfect capital markets. Imperfections may favor investment in physical rather than human capital because human capital is embodied in the individual and this means in the case of default, the financial institution has no collectable collateral on a loan. A physical asset, such as machinery, can be repossessed and sold to recover the loan, whereas human capital cannot. This means that a higher rate on interest is charged on loans intended for investment in human capital, so as to balance out the increased risk to the lender. More young people tend to invest in human capital, but, due to their lower credit ratings and lower set of collateral assets, fewer funds are made available by financial institutions for their investment in human capital.

Capital market imperfections have important consequences. First, due to the increased rates in lending to students (especially those who are young) financial institutions may choose not to make funds available for education. Students from better off families may still be able to afford a college education, while students from poorer families may not. The outcome of this is that the college/high school wage differential will tend to increase; the poor get poorer and the rich get richer. A second implication is that the government may attempt to offset capital market imperfections by subsidizing education or by providing human capital loans.

General Vs. Specific Training

Training, just like education, is associated with an increased future earnings stream as it increases the worker's productivity. It is important to note the distinction between general training and specific training and their subsequent effects on future earnings streams. General training of a worker by a firm refers to the creation of human capital which can be equally utilized by all firms in the industry. Specific training of a worker by a firm refers to the creation of human capital that is of use to that firm alone. The worker normally pays for general training since the skills acquired may be "rented" out to other firms in the form of higher wages when the person leaves the original

firm. The firm will pay for specific training as these specific skills benefit that firm alone and are therefore not transferable.

General training is paid for by the worker during the training period, where the worker typically receives a wage w<wu; wu is the wage of the untrained worker in the same firm. Training helps explain the convex age/earnings profile. Earnings rise quickly as the new skills are acquired, i.e. wt applies. Specific training is paid for by the firm since all benefits accrue to that firm alone. As in the above diagram, during training the worker receives a wage, wu, in excess of their Marginal Revenue Productivity (MRP). The employer is paying the worker more than his worth and is therefore losing out during the training period. However, once the skills have been acquired worker productivity is increased and the employer now gains as wu<MRPt. The employer may decide to pay an above competitive wage, w*t> wu, in order to reduce worker turnover.

Empirical Evidence

We now turn our attention to the empirical evidence. The real IRR is estimated at 14% for white American males in completing high school. Allowing for the ability of students reduces the average ROR on education so that the IRR is between 5% and 10%. Non-pecuniary benefits and costs of a job (job satisfaction, safety standards in the workplace, non-wage benefits etc.) also bias the IRR and the magnitude of such fluctuations are difficult to ascertain. Another factor complicating the measurement of the IRR is the quality of education. The human capital model implicitly assumes that each year of education is homogeneous. This is clearly not so.

Layard's study of British males found that students who attend "selective entry secondary school" earned 11% more than those students who had not. A large differential exists between college and high school male graduates, illustrating that investment in education is profitable. The differentials are lesser between postgraduate and graduate earnings, explained by the diminishing marginal ROR of increased investment.

Earnings tend to level off and even decline due to the ageing process and the slow-down in training. Mincer (1974) showed that earnings peak at 33.75 years of work and then decline. It was briefly explained above that women and other discriminated groups such as blacks, have a more pronounced convex age/earnings profile than men caused by the greater discontinuity in their working careers.

The human capital model has been criticized by many economists on a number of points. First, the model assumes that all expenditures on education are investments. Blaug (1972) refutes this by saying that "*a years schooling for someone, invariably shares both consumption and investment aspects.*" By ignoring these consumption aspects, empirical research underestimates the ROR on educational investments. Second, non-wage benefits are also omitted from the model. The fact that college graduates obtain generally more pleasant and interesting jobs than high school graduates is also omitted and again tends to underestimate the ROR on educational investments.

Third, "screening" has become a contentious issue in educational economics. Proving what schooling actually does is very difficult indeed. It is not easy to distinguish between higher wages caused by increased education, or by the fact that by grading and labeling a student, it is easier and more efficient in finding jobs that are suitable to their skills.

This means that the ROR is overestimated because higher earnings may be due to credentials rather than increased productivity. Fourth, the model does not deal with the tendency that people with more innate ability (higher IQs etc.) go to college more and that they tend to do better in labor markets. Again, the ROR is overestimated. The most fundamental problem lies in the assumption that human capital can be observed in measurable units. The standard used for measuring human capital is the number of years of schooling.

This statistic is by no means conclusive due to the large variation in the quality of education. Wealthier families can afford better education and this quality can not be readily compared to the quality of education afforded by a poorer family. This along with the fact that students from wealthier families tend to invest more in terms of years of education , widens the gap between the average levels of human capital of the rich and the poor. This further increases the earnings differentials between the rich and the poor, distorting a nation's distribution of income.

Other Influences

Studies have found that factors, other than education and training, are found to influence human capital and the levels of earnings. Consider religion, which may be an important dimension of family background and environment. Religion may influence the family values, morals, skills and goals of an individual which are inherited or acquired in childhood. These endowments may be important in the marketplace where honesty, diligence and reliability may affect the returns on human capital and thus increase earnings. Religious beliefs may also be of hindrance in the marketplace: the Amish rejection of modern technology excludes them from many activities for example. Canadian empirical studies have shown that Jews receive higher incomes than non-Jews. Jewish incomes for males are on average 16% higher than for non-Jewish males. The marginal benefit of education seems to be higher for Jews than for non-Jews. However, once account is taken of the fact that a large proportion of the Jewish population (95%) is urbanized, the Jewish/non-Jewish differential falls to 7.25%.

Cultural differences are also used to explain human capital and earnings differentials. Different ethnic views and cultures can lead to systematic differences in utility functions that lead to behavioral differences among women. For instance, black wives have a higher labor force participation rate than white women due to greater marital instability among blacks, extended black family households, black husbands' lower wages and less stable employment. These are just illustrations to show the diversity of factors influencing human capital and earnings differentials.

Conclusion

There are distributional undertones of investment in human capital that must be considered. In formulating policy on education it is crucial that these factors be taken into account. For instance, the tendency for wealthier families to invest more in education (generally speaking, education of higher quality) than poorer families, increases the wage differentials and hence the distribution of income between low and high income families. Subsidization of education has been tried as a means of stimulating the increased participation of students from poorer families in third level education. The outcome of this policy was to in fact further stimulate the participation of students from wealthier families.Blaug's (1972) suggestion of educational vouchers seems to have a more positive effect in solving this problem.

The reality of the situation is that all individuals are not the same and do not possess the same skills and qualities. Individuals tend to be better at some activities than at others and it is these innate qualities that should be exploited. These innate qualities, such as cultural background, social class, religion and personal drive, are very hard to measure empirically, but it is these qualities that make separate us as individuals. Education, important as it is, is only one of a multitude of factors influencing the level of human capital.

Notes

[1] Note how the earnings differential between streams A and B increases over time.

[2] Siebert and Blaug (1985) in their studies of subsidies in education find that it is children from better-off families who tend to take up higher education subsidies. The targeting efficiency of subsidies is inadequate. Blaug is in favor of educational vouchers, whose value declines as parental income increases, as a means of evening-out the distribution of education among the different social classes.

[3] It is important to realize that pure general and pure specific training are only of theoretical use, as they are unrealistic in practice. Training of a mixed form is more likely.

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