Chapter Seven: Man Power Planning

7.1. Theory of Human Capital

The theory of compensating differentials suggests that wages will vary among workers because jobs are different. Wages also will vary because workers are different. Each of us brings into the labor market a unique set of abilities and acquired skills, or human capital. The positive relationship between the level of education and the level of earnings is one of the most robust relationships observed by labor economists. Typically, this relationship is explained using the human capital model. Human capital, in this model, can be thought of as a measure of an individual's productive capacity. Under the human capital model, it is assumed that the level of an individual's earnings is determined by the individual's stock of human capital. We acquire most of our human capital in school and in formal and informal on-the job training programs.

The skills we acquire in school make up an increasingly important component of our stock of knowledge. Hence, now we will focus on the first of these types of investment and discusses how we choose the particular set of skills that we offer to employers and how our choices affect the evolution of earnings over the working life. This chapter analyzes why some workers obtain a lot of schooling and other workers drop out at an early age.

Most economic models of educational attainment are based on the assumption that individuals select the level of educational attainment that results in the highest expected value of lifetime earnings (net of educational costs). Workers who invest in schooling are willing to give up earnings today in return for higher earnings in the future. For example, we earn a relatively low wage while we attend college or participate in a formal apprenticeship program. However, we expect to be rewarded by higher earnings later on as we collect the returns on our investment. The trade-off between lower earnings today and higher earnings later, as well as the financial and institutional constraints that limit access to education, determines the distribution of educational attainment in the population. Simply stated, citreous paribus, a person will attend college only if the value of the expected benefits exceeds the value of the expected costs associated with this choice.

7.1.1. Costs of education

There are three types of costs associated with a college education:

- direct costs such as tuition, books, and supplies,
- forgone earnings (the opportunity cost of time), and

- psychic costs.

Notice that the direct costs include only those direct expenditures that a student would make only if he or she attends college. The costs of meals, dorm fees, etc., would not generally be a cost of education since these individuals would face costs of meals and lodging if they had been engaged in some alternative use of time (such as working). Room and board fees would partially enter as a cost only if these costs are higher than they would have been under the next-best alternative use of time. As noted earlier, the forgone earnings associated with being a full-time student is usually the largest cost associated with acquiring a college or advanced degree. The psychic costs associated with attending college include the stress, anxiety, and sometimes boredom associated with classes, exams, assignments, papers, etc.

7.1.2. Benefits of education

The benefits associated with acquiring a college degree include:

- higher expected earnings,
- more pleasant jobs,
- lower expected unemployment rates, and
- psychic benefits.

In general, college graduates receive not only higher pay, they also receive jobs that are more secure and involve less tedious work, less physical work, more pleasant work environments, better working conditions, higher social status, and so forth. The psychic benefits associated with education include the enjoyment that may be received by being in the college environment.

7.1.3. The Schooling Model

The costs and benefits associated with deciding to acquire a bachelor's degree are represented in the diagram below. This diagram illustrates two possible earnings streams facing an 18-year old high school graduate. The cost associated with college attendance includes both forgone earnings and the direct costs of college. (Note that this diagram suggests that a 22-year old college graduate earns less than they would have at this age if they had gone to work directly after high school. On average, it takes approximately 6-7 years for the earnings of a college graduate to catch up to the earnings of a high school graduate with identical observable characteristics. The area between the earnings with bachelors' degree and high school degree starting from age 28/29 represents the increase in earnings that a college graduate would be

expected to receive over the rest of his or her work life (These earnings streams, of course would differ across individuals due to differences in individual ability and costs).

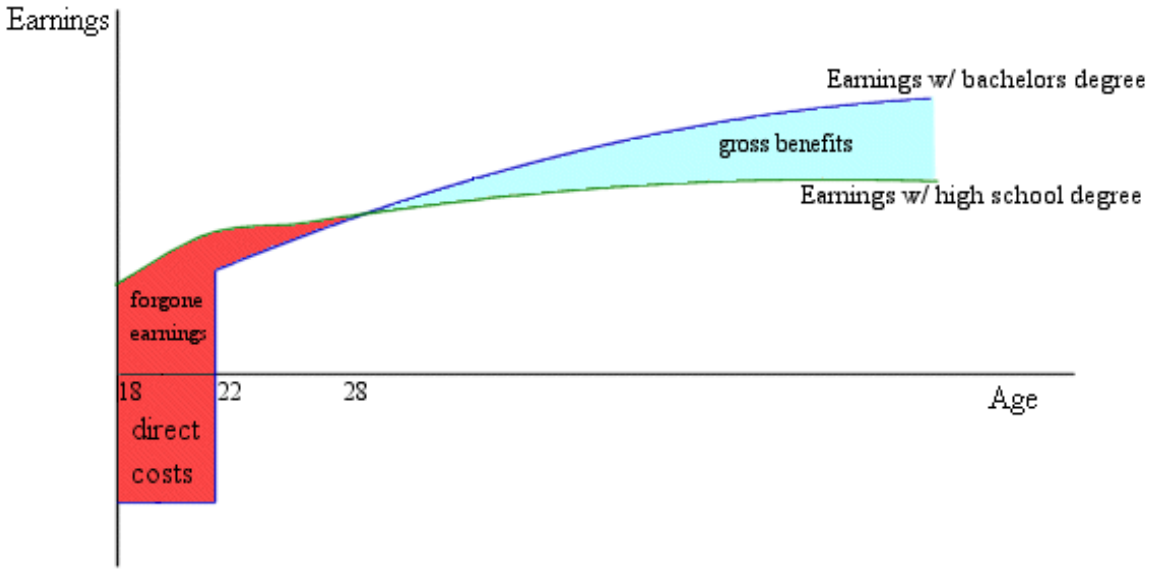

Fig.7.1. Benefits and costs of education

Any study of an investment decision—whether it is an investment in physical or in human capital—must contrast expenditures and receipts incurred at different time periods. In other words, an investor must be able to calculate the returns to the investment by comparing the current cost with the future returns. To determine the rate of return on investment in human capital, it requires the comparison of future benefits to current cost. However, the value of a birr received today is not the same as the value of a birr received tomorrow. The notion of present value allows us to compare dollar amounts spent and received in different time periods.

Suppose somebody gives you a choice between two monetary offers: You can have either 100 birr today or 100birr next year. Which offer would you take? A little reflection should convince you that 100 birr today is better than100 birr next year. After all, if you receive 100 birr today, you can invest it, and you will then have 100 (1 + 0.05) birr next year (or 105 birr), assuming that the rate of interest equals 5 percent. Note, moreover, that receiving 95.24 birr today (or 100 /1.05) would be worth 100birr next year. Hence, the present value (or the current birr value) of receiving 100birr tomorrow is only 95.24 birr. In general, the present value of a payment of, say, *y* birr next year is given by

$$PV = y/1 + r$$

It is expected that an individual would attend college if the present value of the costs is less than the present value of the benefits. To convert future birr (B) in year "n" in to present birr, future birr must be discounted (divided) by $(1+r)^n$ so the present value of future benefit (PV) over time can be calculated as follow:

$$PV=B_1/(1+r) +B_2/(1+r)^2 +B_3/(1+r)^3 +\ldots\ldots+B_t/(1+r)^n$$

A person's schooling decision maximizes the present value of lifetime earnings. Therefore, the worker attends college if the present value of the net benefit is greater than zero (the present value of the gross benefit of education exceed the present value of forgone earning and direct cost of getting college education).

Let's illustrate the worker's decision with a simple numerical example. Suppose a worker lives only two periods and chooses from two schooling options. He can choose not to attend school at all, in which case he would earn 20,000 birr in each period. The present value of earnings is $PV0 = 20,000 + 20,000/1 + r$. He also can choose to attend school in the first period, incur $5,000 worth of direct schooling costs, and enter the labor market in the second period, earning 47,500 birr. The present value of this earnings stream is $PV1 = -5,000 + 47,500/1 + r$. Suppose that the rate of discount is 5 percent. It is easy to calculate that $PV0 = 39,048$ birr and that $PV1 = 40,238$ birr. The worker, therefore, chooses to attend school. Note, however, that if the rate of discount were 15 percent, $PV0 = 37,391$ birr, $PV1 = 36,304$ birr, and the worker would not go to school.

7.1.4 Optimal Level of Investment (The Stopping Rule)

An individual will acquire additional education as long as the value of the marginal benefits from this additional education outweighs the value of the marginal costs of education. Which level of schooling should a person choose? It turns out that the intersection of the *MB* curve and the MC curve determines the optimal level of schooling for the worker (MB=MC). Those individuals who have higher benefits and/or lower costs will acquire more education. The diagram below illustrates the optimal level of schooling and the effect of changes in MC and MB on the optimal level of human capital investment.

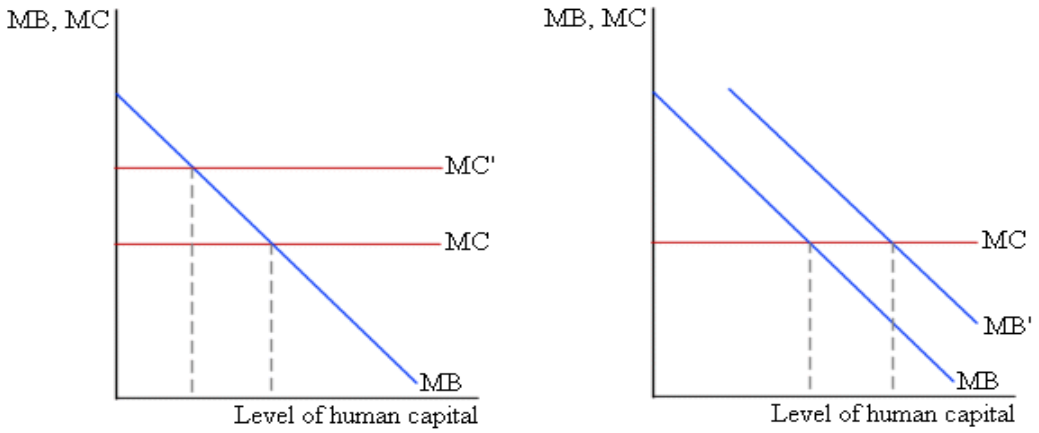

Fig7.2. Optimal level of investment associated

We can also consider the marginal rate of return on the decision of when to quit school. Marginal rate of return to schooling refers to percentage change in earnings resulting from one more year of school. The marginal rate of return to schooling can also give the percentage increase in earnings per birr spent in educational investments. The monetary gains from each additional year of schooling decline as more schooling is acquired. In other words, the law of diminishing returns also applies to human capital accumulation. Each extra year of schooling generates less incremental knowledge and lower additional earnings than previous years. The marginal rate of return (MRR) schedule, therefore, is a declining function of the level of schooling. Suppose that the only costs incurred in going to college are forgone earnings and the worker has a rate of discount *r* that is constant; that is, it is independent of how much schooling he gets. The intersection of the *MRR* curve and the horizontal rate of discount schedule determines the optimal level of schooling for the worker (MRR=r).

7.1.5. Factors Affecting Human Capital Investment

The human capital model suggests that the level of human capital investment is affected by:

- Interest rates,
- The age of the individual,
- The costs of education, and
- The wage differential between high school and college graduates.

Since most of the benefits associated with a college degree occur relatively later in the lifecycle while the costs are borne more immediately, an increase in the interest rate facing an individual will be expected to lower the net benefit of education (This occurs because an increase in the interest rate lowers the present value of more distant benefits and costs by more than it lowers the

benefits of short-term benefits and costs). Government subsidized student loan programs are designed to reduce interest rate differentials across households. In the absence of these subsidized interest rates, low-income households would face substantially higher interest rates, resulting in a lower probability that children from such households will attend college.

It is expected that individuals will tend to invest more in education at an earlier stage of their lifecycle because this results in a larger period over which the increased earnings may be realized. The theory discussed above, of course, directly predicts that more people will attend college when the costs are lower and/or the benefits are higher.

7.1.6 On the Job Training

Many workers augment their human capital stock after completing their education, particularly through on-the-job training (OJT) programs. Evidently, OJT is an important component of a worker's human capital stock. There are two types of OJT: general training and specific training. General training is the type of training that, once acquired, enhances productivity equally in all firms. On the other hand, specific training is the type of training that enhances productivity only in the firm where it is acquired and the productivity gains are lost once the worker leaves the firm. In reality, much OJT is a mixture of general and specific training, but the conceptual separation into purely general and purely specific training is extremely useful.

Consider a simple framework where the employment relationship between a competitive firm and the worker lasts two periods. Suppose that in the first period (when the worker is hired), the total labor costs equal $TC1$ birr, and in the second period, the costs equal $TC2$ birr. Similarly, the values of marginal product in each of the two periods are $VMP1$ and $VMP2$, respectively. Finally, let r be the rate of discount. The profit maximizing condition giving the optimal level of employment for the firm over the two periods is

$$TC1 + TC\ 2/1+r = VMP1 + VMP2/1 + r$$

The left-hand side of the equation gives the present value of the costs associated with hiring a worker over the two-period life cycle. The right-hand side gives the present value of the worker's contribution to the firm. It is easy to see that this equation generalizes the condition that the wage equals the value of marginal product. In a multi-period, framework, the analogous condition is that the present value of employment costs equals the present value of the value of marginal product.

Suppose OJT takes place only in the first period. It costs the firm H dollars to put a worker through the training. These costs include teacher salaries and the purchase of training equipment. The total cost of hiring a worker during the first period can be written as the sum of training costs H and the wage paid to the worker during the training period, or $w1$ .This implies that $TC\,1 = w1 + H$. Because no training occurs in the second period, the total cost of hiring the worker in the second period simply equals the wage. We can then rewrite the above equation as

$$w1 + H + w2/1 + r = VM\,P1 + VM\,P2/1 + r$$

Who Pays for General Training?

In the post-training period, the worker's value of marginal product increases to $VMP2$ in *all* firms. As a result, many firms are willing to pay the worker a wage equal to $VMP2$. The firm that provided the training must either follow suit and increase the wage to $VMP2$ or lose the worker. Therefore, the second period wage, $w2$, will equal $VMP2$. As a result,

$$w1 = VM\,P1 - H$$

Therefore, the first-period wage equals the value of the worker's initial marginal product minus training costs. In other words, workers pay for general training by accepting a lower "trainee wage" during the training period. In the second period, workers get the returns from the training by receiving a wage that equals the value of their post-training marginal product. Competitive firms provide general training only if they do not pay any of the costs.

It is common for trainees in formal apprenticeship programs to receive low wages during the training period and to receive higher wages after the training is completed. Similarly, medical interns earn low wages and work long hours during their residency, but their investment is well rewarded once they complete their training. If a firm were to pay for general training, it would surely attract a large number of job applicants. Workers would quickly realize that this firm was offering free general training. Because the firm cannot legally enslave its employees after they receive their degree, the workers would take advantage of the free training opportunities and then run to a firm that offers higher wage to their newly acquired skills. Therefore, a firm that paid for general training and did not raise the post-training wage would get an oversupply of trainees and the workers would quit in the post-training period. However, a profit-maximizing firm would quickly learn that it can lower the wage because there is an oversupply of trainees, passing on the training costs to the workers.

Who Pays for Specific Training?

The productivity gains resulting from specific training vanish once the worker leaves the firm. As a result, the worker's alternative wage (that is, the wage that other firms are willing to pay) is independent of the training and equals his pre-training productivity. Who then pays for specific training and who collects the returns? Consider what would happen if the firm paid for specific training. The firm could incur the cost and collect the returns by not changing the wage in the post-training period, even though the worker's value of marginal product in this firm has increased. Because VMP2 would then exceed w2, there are gains to providing the training. However, if the worker were to quit in the second period, the firm would suffer a capital loss. The firm, therefore, would hesitate paying for specific training unless it has some assurance that the trained worker will not quit.

Suppose instead that the worker pays for the specific training. Workers would then receive a low wage during the training period and higher wages in the post-training period. The worker, however, does not have an ironclad assurance that the firm will employ him in the second period. If the worker were to get laid off, he would lose his investment. The worker, therefore, is not willing to invest in specific training unless he is very confident that he will not be laid off.

Both the firm and the worker, therefore, are reluctant to invest in specific training. The problem arises because there does not exist a legally binding contract that ties together workers and firms. Neither party wishes to take the initiative and pay for the training. Making some improvement on the post-training wage can reduce the probabilities of *both* quits and layoffs. Consider a labor contract in which the worker's post-training wage, $w2$, is set such that

$$w < w2 < VMP\ 2$$

Where w is the alternative wage. This contract implies that the worker and the firm share the returns from specific training. The worker's post-training wage $w2$ is higher than his productivity elsewhere, but less than his productivity at the current firm. Note that because the worker is better off in this firm than elsewhere, he has no incentive to quit. Similarly, because the firm is better off by employing the worker than by laying him off (that is, the worker gets paid less than his value of marginal product), the firm does not want to let the worker go. If both the firm and the worker share the returns of the specific training, therefore, the possibility of job separation in the post-training period is eliminated. If firms and workers do share the returns of specific training, they also will have to share the costs.

7.2. Approaches of Labor Planning

Labor planning is generally concerned with assessing the training needs of the labor market and adjusting the supply to meet the demand of the economy through education.

I. Man power Requirement Approach

This approach involves the following steps

1. Forecasting the demand for educated man power
2. Forecasting the supply of educated man power
3. Balancing the demand and the supply

II. Rate of Return Approach

This approach focuses on the consideration of the net return on educational expenditure, measured as the increase in net income that an individual will enjoy throughout his/her life in relation to the income he/she would have earned if he/she had not reached a given educational level (See section 7.1.3).