ECO315: Labour Market and Education Policy

Lecture 3. Human Capital Concepts

1. Human Capital

(1) Definition

Investments that aim at increasing a worker's pay are called human capital investments. They include education, training, health care, migration, and search for new jobs. Among them, education, training and health care serve to raise one's human capital stock whereas migration and job searching help to increase the value of one's human capital by increasing the price (wage) received for a given stock of human capital.

(2) Investment in human vs. physical capital

- Similarity: both involve an initial cost, and are made in the hope that the investment will pay off well into the future.
- differences: investors of physical capital own their investments while investors of human capital might not (firms train their workers); investments in human capital have positive externality while investments in physical capital may not have.

(3) Stages of human capital investments

Human capital investment involves ones' life-time. It generally includes the following three stages:

- pre-school
- schooling
- on-the-job training

(4) Age/earning profile

One's life-time earning profile is a concave curve, reflecting an increasing in earnings associated with increase in human capital stock up until a certain age and then declining in earnings associated with decrease in human capital stock (depreciation out-weights investment) pass that age.

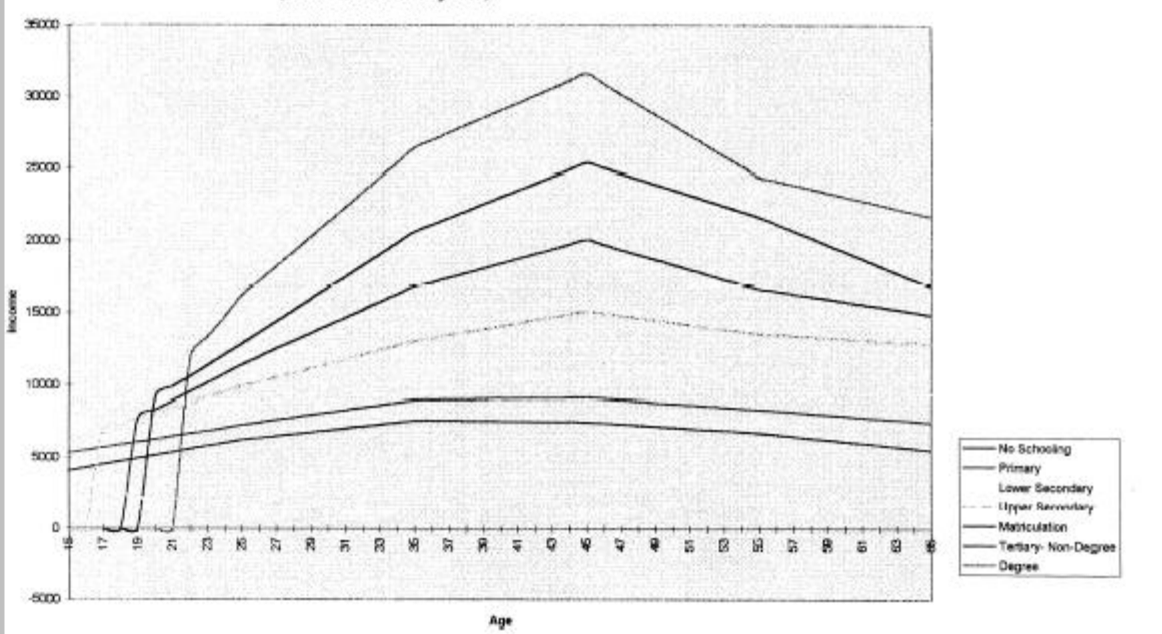

Figure 6.4 (IX): Chart of Age-Earning Profile for Workers at Various Education Level (1996) (Without Smoothing-out)

2. Investment in human capital

The investment should be made up to the level that the present value of future benefits equals the total (current) costs. One would invest more intensively when young due to more expected years of return and less intensively when old.

(1) Costs

Direct costs: books, tuition and other costs that are directly spent on education.

Indirect costs: forgone earnings (opportunity costs), psychic costs.

(2) The investment decision

Education should be invested up to the level that the present value of future benefits equals to the total (current) costs.

Assume that the future stream of benefits of human capital investment are $B_t (t = 1,2,\cdots T)$, where T is the retirement age; the current cost of investment is C; and the discount rate is i, then the present value of future benefits is:

$$PV = \frac{B_1}{(1+i)} + \frac{B_2}{(1+i)^2} + \cdots + \frac{B_T}{(1+i)^T}$$

The optimal investment should be up to the level: $PV = C$

(3) Internal Rate of Return

If one assumes $B = B_1 = B_2 = \cdots = B_T$, the internal rate of return, r, to investment is

$$r = \frac{B}{C}$$

3. The Ben-Porath model

For a formal analysis of human capital investment, one can use the Ben-Porath model.

Human capital production function: $Q_t = (s_t K_t)^b$, where Q_t are units of human capital (called eds) output; s_t is proportion of human capital stock employed for human capital production ($0< s_t < 1$); K_t is human capital stock at time t; b is 'ability' parameter.

Present value of benefit is:
$PV_t = \frac{wQ_t}{(1+i)} + \frac{wQ_t}{(1+i)^2} + \cdots + \frac{wQ_t}{(1+i)^{T-t}} = \frac{wQ_t}{i}[1 - \frac{1}{(1+i)^{T-t}}]$, where T is retirement age; i is discount rate..

Cost function (opportunity cost): $C_t = ws_t K_t = wQ_t^{\frac{1}{b}}$, where w is the rental rate (wage rate) of per unit of human capital, ed.

Marginal benefit = marginal cost yields:

$$\frac{\partial PV_t}{\partial Q_t} = \frac{w}{i}[1 - \frac{1}{(1+i)^{T-t}}] = \frac{\partial C_t}{\partial Q_t} = \frac{1}{b} wQ_t^{\frac{1}{b}-1} \text{ or } Q_t = \{\frac{b}{i}[1 - \frac{1}{(1+i)^{T-t}}]\}^{\frac{b}{(1-b)}}$$

The lifetime human capital investment of an individual therefore depends on *b*, *i*

and *t*. It increases with *b* and decreases with *i* and *t*.

Tutorial on Present value calculations:

If we take \$100 and deposit in a fixed interest rate saving account in a bank with a 10% interest rate, we would have \$110 in one year time.

i.e.

$$(\text{Present Value}) \times (1+r) = \text{Future Value}$$
$$100 \times (1.10) = 110$$

In two years time that same investment would yield \$121.

i.e.

$$(\text{Present Value}) \times (1+r) \times (1+r) = \text{Future Value in two years}$$
$$100 \times (1.10) \times (1.10) = \text{Future Value in two years}$$
$$100\,(1.10)^2 = 121$$

We could also reverse the calculation and ask, how much should a person pay today to receive \$121 in two years time or what is the present value of \$121 paid in two years time?

Because

$$(\text{Present Value}) \times (1.10)^2 = \text{Future Value in two years}$$

We can substitute in 121 and divide both sides by the discount factor $(1.10)^2$

$$(\text{Present Value}) \times (1.10)^2/(1.10)^2 = 121/(1.10)^2$$

or

$$\text{Present Value} = 121/(1.10)^2$$

or

Present Value = 100

Thus, the present value of some amount paid in t years time equals to that future amount divided by the discount factor or $(1+r)^t$, where r is the discount rate (the opportunity cost of investment).