Class exercise

EE473

Question1

Debbie is about to choose a career path. She has narrowed her options to two alternatives. She can become either a marine biologist or a concert pianist. Debbie lives two periods. In the first, she gets an education. In the second, she works in the labor market. If Debbie becomes a marine biologist, she will spend $15,000 on education in the first period and earn $472,000 in the second period. If she becomes a concert pianist, she will spend $40,000 on education in the first period and earn $500,000 in the second period

a. Suppose Debbie can lend and borrow money at a 5 percent rate of interest between the two periods. Which career will she pursue? What is she can lend and borrow money at a 15 percent rate of interest? Will she choose a different option? Why?

b. Suppose musical conservatories raise their tuition so that it now costs Debbie $60,000 to become a concert pianist. What career will Debbie pursue if the interest rate is 5 percent?

Debbie will compare the present value of income for each career choice and choose the career with the greater present value. If the interest rate is 5 percent,

$$PV_{Biologist} = -\$15{,}000 + \$472{,}000/(1.05) = \$434{,}523.81$$

and

$$PV_{Pianist} = -\$40{,}000 + \$500{,}000/(1.05) = \$436{,}190.48.$$

Therefore, she will become a concert pianist.

If the rate of interest is 15 percent, however, the present value calculations become

$$PV_{Biologist} = -\$15{,}000 + \$472{,}000/(1.15) = \$395{,}434.78$$

and

$$PV_{Pianist} = -\$40{,}000 + \$500{,}000/(1.15) = \$394{,}782.61.$$

In this case, **Debbie becomes a biologist**. As the interest rate increases, the worker discounts future earnings more, lowering the returns from investing in education.

Debbie will compare the present value of being a biologist from part (a) with the present value of becoming a pianist. The relevant present values are:

$$PV_{Biologist} = -\$15{,}000 + \$472{,}000/(1.05) = \$434{,}523.81$$

and

$$PV_{Pianist} = -\$60{,}000 + \$500{,}000/(1.05) = \$416{,}190.48.$$

In this case **Debbie will become a biologist, showing that as the cost of an investment increases, the chance of pursuing that investment falls**.

Question 2

Peter lives for three periods. He is currently considering three alternative education-work options. He can start working immediately, earning $100,000 in period 1, $110,000 in period 2 (as his work experience leads to higher productivity), and $90,000 in period 3 (as his skills become obsolete and physical abilities deteriorate).

Alternatively, he can spend $50,000 to attend college in period 1 and then earn $180,000 in periods 2 and 3.

Finally, he can receive a doctorate degree in period 2 after completing his college education in period 1. This last option will cost him nothing when he is attending graduate school in the second period as his expenses on tuition and books will be covered by a research assistantship. After receiving his doctorate, he will become a professor in a business school and earn $400,000 in period 3.

Peter's discount rate is 20 percent per period.

What education path maximizes Peter's net present value of his lifetime earnings?

The present discounted values of Peter's earnings associated with each of the alternatives are

$$PV_{HS} = 100{,}000 + \frac{110{,}000}{1.2} + \frac{90{,}000}{1.2^2} = \$254{,}167$$

$$PV_{COL} = -50{,}000 + \frac{180{,}000}{1.2} + \frac{180{,}000}{1.2^2} = \$225{,}000$$

and

$$PV_{PhD} = -50{,}000 + \frac{0}{1.2} + \frac{400{,}000}{1.2^2} = \$227{,}778$$

Thus, the best option for Peter is to start working immediately upon completely high school.

Question 3

Jane has three years of college, pam has two, and Mary has one. Jane earns $21 per hour, Pam earns $19, and Mary earns $16. The difference in educational attainment is due completely to different discount rates.

How much can the available information reveal about each woman's discount rate?

The returns to increasing one's education from one to two years of college and then from two to three years of college are

$$r_{1to2} = \frac{\$19 - \$16}{\$16} = 18.75\% \; and \; r_{2to3} = \frac{\$21 - \$19}{\$19} = 10.53\%$$

Having observed their educational choices, we know that **Mary's discount rate is greater than 18.75 percent** (otherwise she would have invested in a second year of education and earned 18.75% on the investment), **Pam's is between 10.53 percent and 18.75 percent**, and **Jane's is less than 10.53 percent**.

Question 4

Suppose the skills acquired in school depreciate over time, perhaps because technological change makes the things learned in school obsolete.

What happens to a worker's optimal amount of schooling if the rate of depreciation increases?

Answer

If the rate of depreciation is very high, the payoff to educational investments declines.

As a result, a worker's optimal amount of schooling will also fall as the benefits of education erode more rapidly.

Question 5

a. Describe the basic self-selection issue involved whenever discussing the returns to education.

b. Does the fact that some high school or college dropouts go on to earn vast amounts of money (e.g. Bill Gates dropped out of Harvard without ever graduating) contradict the self-selection theory?

c. Most government-provided job training programs are optional to the worker. Describe how the self-selection issue might be used to call into question empirical results suggesting there are large economic benefits to be gained by requiring all workers to receive government-provided job training.

Part a.

People choose their level of education knowing their own abilities, preferences, and financial situation. Most important here is knowing one's abilities.

Highly capable people would likely earn a large salary even if they didn't attend college, but they choose to attend because they earn even more (net of the cost of college) by doing so.

Likewise, less capable people know they are less capable and that they will not get very high paying jobs even with a college degree.

Consequently, highly capably people tend to go to college while less capable people are less likely to go to college, and the average wage of college graduates is higher than the average wage of non-college graduates largely because of self-selected education levels due to innate skills or abilities.

Part b.

No. One, there are always exceptions. And two, if the cost of education gets large enough (or the returns to education get small enough), even high ability people will forego college.

Part c.

As job training programs are optional, and willingness to work or try to get a new job or to get retrained is probably the most important factor in a person's success, there is certainly a self-selection story to be told. In particular, the successful people coming out of job training programs would likely have been successful even if left on their own because of their innate ability or motivation. Similarly, the people who did not choose job training and failed to get a job would likely have failed to get a job even if the government required them to pursue job training.