

■ Applications

Increases in the Cost of Education

35. According to data presented in Table 9.1 of *Modern Labor Economics*, the college enrollment rates of high school graduates rose most rapidly during the period 1980 to 1985. During that period, enrollment rates for men rose 11.9% while the rates for women rose 5.1%. On the other hand, according to data published in *The Wall Street Journal* (August 17, 1988, p. 31), the average annual cost of tuition and fees at public four-year colleges and universities rose from \$706 to \$1,242, a 76% increase. For four-year private colleges and universities, average tuition and fees rose 65% from \$3,279 to \$5,418. These increases far exceeded the 31% increase in the Consumer Price Index that took place over this time. How is it possible that college enrollment rates could be rising at the same time college costs were rising so substantially in real terms?

Changing Patterns in Graduate Business School Enrollments

36. According to data presented in Table 9.3 of the text, the percentage of women among those graduating with master's degrees in business rose dramatically from 3.9% in 1971 to 37% in 1995. In the fall of 1992, however, *The Wall Street Journal* reported on what appeared to be a change in that trend. According to an article in the September 25, 1992 issue (p. B1), women as a percentage of entering Master of Business Administration (M.B.A.) classes had fallen substantially at many top schools after peaking in the 1980s.

A career counselor interviewed in the article said the changes occurred because “a lot of women who were the pioneers in M.B.A. programs and big companies rushed blindly into what were formerly forbidden areas. . . . Now, a lot of these women have come back and told their younger sisters, ‘It’s not that great out there’.”

Using the human capital investment framework, assess the reasonableness of this explanation.

Estimating the Relationship Between Education and Earnings

- *37. The age-earnings profiles presented in Chapter 9 of the text clearly show that at any given age, workers with more education tend to earn higher wages, holding all else constant. In a 1974 book entitled *Schooling, Experience, and Earnings*, economist Jacob Mincer presented a framework for specifying what that relationship might look like. Mincer started by defining the rate of return (r) to one additional year of education, say, beyond the high school level as

$$r_1 = \frac{Y_1 - Y_0}{Y_0},$$

where Y_0 is the income level a person with a high school education could expect, while Y_1 is the income level a person could expect after receiving one year of additional education. Similarly, the rate of return to a second year of education (r_2) could be defined as

$$r_2 = \frac{Y_2 - Y_1}{Y_1}.$$

Taken together, the two equations imply that the income derived from two years of education could be expressed as

$$Y_2 = Y_0(1 + r_1)(1 + r_2).$$

If r is assumed to be constant over time, after S years of education, income could be expressed as

$$Y_S = Y_0(1 + r)^S.$$

Taking the natural logarithm (\ln) of both sides of the equation yields

$$\ln Y_S = \ln Y_0 + S \ln (1 + r).$$

Mincer then noted for small values of r , $\ln(1 + r)$ could be approximated by r [e.g., $\ln(1 + 0.1) = 0.095 \approx 0.1$]. This means that the relationship between earnings and education can be simplified to

$$\ln Y_S = \ln Y_0 + rS.$$

Such an equation is often called a **human capital earnings function**.

- *37a. Given the techniques discussed in the Appendix to Chapter 1, explain how one could estimate the parameter r in the above model.
- *37b. Are there any variables that have been omitted from the above model that you think should be included? Would the omission of these variables bias the estimate of r at which you arrived? What would be the direction of the bias?
- *37c. Would the estimate of r be likely to suffer from selection bias? If so, what would be the direction of the bias?

*37d. Given this model, the rate of return on education can be expressed as

$$r = \frac{\ln Y_S - \ln Y_0}{S}.$$

Suppose that after graduating from high school the typical student can earn \$25,000. After graduating from college 4 years later, suppose the same individual can earn \$35,000. What is the rate of return on the college investment?

*37e. Given the information in **37d**, would college be considered a good investment for the individual?

Lowering the Cost of Obtaining Educational Signals

38. In 1993 the Clinton administration proposed and successfully passed a program where students receive subsidies to attend college in return for agreeing to perform a national service job after graduation.

To see the effects of lowering educational costs in the context of the signaling model of education, consider Figure 9-8 which shows the present value of lifetime earnings (PVE) firms are willing to offer to workers who have attained different levels of education.

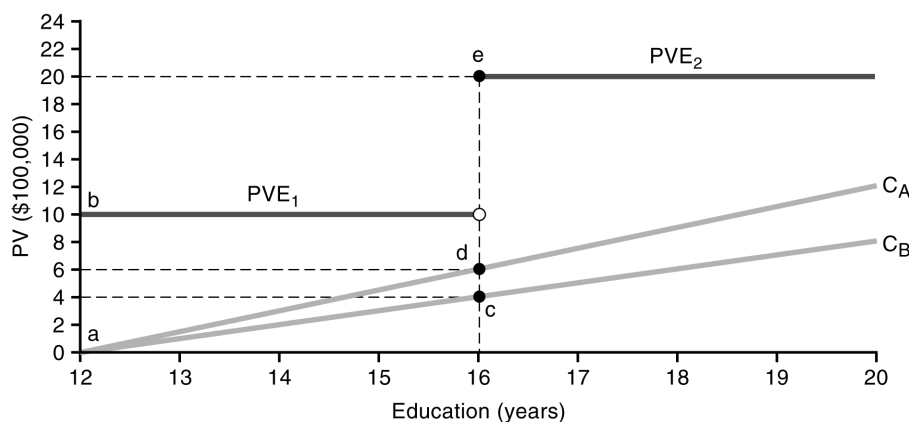


Figure 9-8

Those workers who have completed 16 years or more of education (4 or more years after high school) will be offered a wage leading to a present value of lifetime income of \$2,000,000 (PVE₂), while those completing less than 16 years of education will be offered a wage leading to a present value of lifetime income equal to \$1,000,000 (PVE₁). Lines C_A and C_B show the total cost of different levels of education for two types of workers. Type A workers are low-productivity workers while type B workers are high-productivity workers. The cost levels shown in Figure 9-8 are 50% of the costs assumed in Figure 9-6 from Problem 32.

- 38a. What is the net benefit (i.e., the difference between the PVE and the cost of education) a type A person would derive from attaining 16 years of education? What would be the net benefit from 12 years of education? What is the optimal level of education for a type A person?
- 38b. What is the net benefit a type B person would derive from attaining 16 years of education? What would be the net benefit from 12 years of education? What is the optimal level of education for a type B person?

- 38c. Is 16 years of education an effective way to distinguish low-productivity workers from high-productivity workers? Has lowering the cost of education increased or decreased the social benefits derived from education?
- 38d. A major concern in higher education today is grade inflation, the tendency of professors to give A_s and B_s to students who in the past would have earned C_s or D_s . What effect does grade inflation have on the ability of education to function as an effective signal of the most productive individuals?

Mandatory Increases in the Level of Education (Appendix 9B)

39. In Figure 9-9, the curves labeled A_2 and B_2 refer to indifference curves between the wage and the level of non-compulsory schooling attained for two individuals, while the curves Y and Z refer to zero-profit isoprofit curves for two firms. Suppose that initially persons A and B are perfectly informed about the wage and education combinations available in the market and mobile enough to choose the combinations that best suit their preferences. The result is that person A chooses point a and person B chooses point b .

Now suppose that the state in which A and B work passes an occupational licensing law that requires workers in this profession to attain a certain minimum level of education at accredited schools. Assume that the law requires at least 8 additional years of formal education.

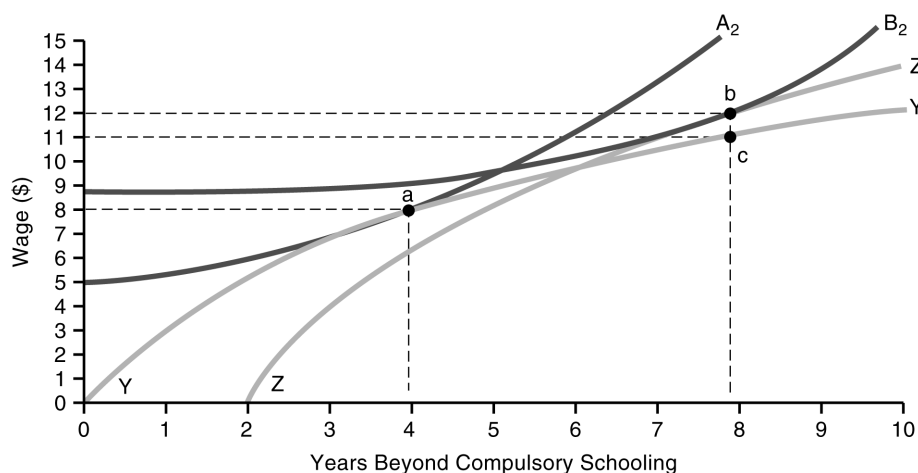


Figure 9-9

- 39a. Assuming A and B are not tied to any particular employer, what would be the effect of this licensing law?
- 39b. What would be the effect of the law assuming A and B are tied to their current employers?

