

1. Consider the following version of the human capital model. The income generating function is of the form:

$$Y(S_i) = \exp\left(b_i S_i - \frac{S_i^2}{2}\right)$$

where $b_i > 0$, S_i is the schooling level chosen by individual i and Y is income. The costs of education are determined by the following function:

$$g(S_i) = c + r_i S_i$$

where $c > 0$ and $r_i > 0$. Individuals choose S to maximize utility: $U(S) = \log[Y(S)] - g(S)$.

- a) What is the optimal level of schooling S^* that individuals choose in this model?
- b) Given the optimal choice of S , what is the return to schooling $\beta^* = \frac{Y'(S)}{Y(S)}$?
- c) Now, interpret the variable S so that individual attends college if $S > 0$ and only gets the compulsory education if $S \leq 0$. Assume that parameters r and b are distributed in the population in the following way:

	b_i	
r_i	0	1
0	20%	30%
1	30%	20%

How large a fraction of the population attends college in this economy? Suppose that the government introduces a policy that reduces r_i to 1/2 for those whose r_i was previously 1. How large a fraction of the population will attend college as a result of this reform?

2. Suppose the firm's production function is given by

$$q = 10\sqrt{E_w + E_b},$$

where E_w and E_b are the number of whites and blacks employed by the firm respectively.

Suppose the market wage for black workers is \$10, the market wage for whites is \$20, and the price of each unit of output is \$100.

(a) How many workers would a firm hire if it does not discriminate? How much profit does this non-discriminatory firm earn if there are no other costs?

(b) Consider a firm that discriminates against blacks with a discrimination coefficient of .25 (such that the adjusted cost of hiring a black worker is $w_b(1 + d)$). How many workers does this firm hire? How much profit does it earn?

(c) Finally, consider a firm that has a discrimination coefficient equal to 1.25. How many workers does this firm hire? How much profit does it earn?

3. Consider the following wage distribution and income and payroll tax schedule. Suppose 40 percent of households earn \$30,000, 30 percent earn \$60,000, 20 percent earn \$120,000, and 10 percent earn \$400,000. Marginal income tax rates are 0 percent up to \$25,000, 15 percent on income earned from \$25,000 to \$50,000, 25 percent on income earned from \$50,000 to \$150,000, and 40 percent on income earned in excess of \$150,000. There is also an 8 percent payroll tax on all income up to \$90,000.
- a) What is the marginal tax rate and average tax rate for each of the four types of households? What percent of the total income tax is paid by each of the four types of households? What percent of the total payroll tax bill is paid by each of the four types of household?
 - b) What is the Gini coefficient for the economy before taxes? What is the Gini coefficient after taxes? [Hint: assume there are 1,000 households in the economy].
 - c) What happens to the after-tax Gini coefficient if all taxes were replaced by a single 20 percent flat tax on all incomes?
 - d) How would your answer to part (c) change if you were to also take into account the changes in labor supply and earnings of the 4 different groups in response to the changes in the tax schedule? State clearly any assumptions you make to obtain your answer.

4. A researcher finds that earnings of college graduates are positively correlated with Grade Point Average (GPA) in college.

Economist A: “These results are not surprising. Students with higher GPA have learned more material in school, and therefore are more productive workers. This is consistent with human capital theory.”

Economist B: “I don’t think this is the explanation for the finding. The positive correlation is just due to signaling.”

- a) Explain Economist B’s claim.
- b) Assume that some students work in occupations that are highly compatible with their major field of study in college (e.g., journalist majors work as journalists, drama majors are involved in theater production, etc.), while others work in incompatible occupations (English majors as economic consultants). If the human capital theory (Economist A’s theory) is correct, would you expect to observe a stronger correlation between earnings and GPA for workers in compatible or incompatible occupations?
- c) Assume that some students attend selective colleges, while others attend less selective colleges. If the signaling theory (Economist B’s theory) is correct, would you expect to observe a stronger correlation between earnings and GPA for workers that attended more selective or less selective colleges?
- d) Assume that you have data for a sample of recent college graduates, on log earnings, a student’s GPA in college, an index of compatibility between the student’s major and his occupation, and a measure of the selectivity of the college. Write down a regression equation that would allow you to test the theories of Economists A and B. Be specific about the hypotheses to be tested, and how you would implement the test.