Economics of Education Frank Levy
14.48J/11.126J Spring, 2007

Midterm Exam - Answer All Questions

PLEASE USE ONLY YOUR MIT ID ON BLUEBOOKS – NO NAMES

Q's 1,2 in one bluebook, Q's 3,4 in a second bluebook

This is a long exam. Read it through so you can allocate your time effectively.

1) In the fictitious economy of Staten Island, each 18 year-old makes the college-going decision by applying the net-present value calculations of human capital theory. Below are the earnings data that faced 18 year-olds in 1969 and 1999 respectively. All dollar figures have been adjusted for inflation and are expressed in 2006 dollars.

1969: Annual Earnings of a High School Graduate (earnings are constant from age 18-65)	$22,000
Annual Earnings of a College Graduate (earnings are constant from age 22-65)	$33,000
1999: Annual Earnings of a High School Graduate (earnings are constant from age 18-65)	$31,000
Annual Earnings of a College Graduate (earnings are constant from age 22-65)	$39,000

a) (5 points) Use your knowledge of the U.S. economy since World War II to briefly explain how the real earnings of college and high school graduates could both be higher in 1999 than they were in 1969.

b) (10 points) Using labor supply and labor demand, give two different scenarios that could have generated the changed relationship between high school and college earnings over the thirty years. Illustrate your scenarios with appropriate diagrams.

c) (5 points) Explain what data you would need to distinguish between the two scenarios and how you would use these data.

d) (5) Are there conditions that would make college a better investment in 1999 than it was in 1969? Briefly explain why or why not.

2) (25 points) We have proposed skill-biased technical change (SBTC) as one explanation of the rising ratio [median college graduate earnings/median high school graduate earnings] over recent decades. A closer look at recent earnings data reveals the following additional patterns:

- The variance of earnings *among* college graduates has been increasing.

- The variance of earnings *among* of high school graduates has been relatively stable.

a) (15 points) Sketch a more detailed theory of SBTC that can explain these two trends.

b) (10 points). Given the existence of these two additional trends, explain whether college can continue to serve as a signal to employers.

3) (25 points) In a paper called "Computing Inequality: Have Computers Changed the Labor Market?", the authors examine the hypothesis that computers have increased demand for skilled workers. In one of their exercises, they estimate the following regression:

$$\Delta E_i = 0.028 + 0.152\Delta C_i + \varepsilon_i$$
$$\quad (0.059) \;\; (0.025)$$

where ΔE_i is the change in the proportion of workers with a college degree in industry *i* from 1979 to 1993 and ΔC_i is the change in the proportion of workers who use a computer in industry *i* between 1984 and 1993. (Standard errors are in parentheses.)

a) (5 points) State precisely what the coefficient on ΔC_i means. How do you know whether it reflects a real pattern in the world and not just random chance in the authors' sample?

b) (10 points) A modern-day Luddite seizes upon this regression and announces, "Ahah! Computers *have* caused demand to shift toward workers with a college degree and away from less educated workers. If I could somehow get rid of all the computers, this regression proves that demand for workers without a college degree would go up." Explain why the Luddite's inference might be incorrect. (Try to give a concrete reason why we might estimate the regression above even though the Luddite is mistaken.)

c) (10 points) In the next table, the authors present similar regressions, but with the change in college-level employment calculated over different time periods. The change in computer use is always calculated between 1984 and 1993. They obtain the following results:

$$\Delta E_i^{1960–1970} = 0.085 + 0.071\Delta C_i + \varepsilon_i$$
$$(0.058)\ \ (0.025)$$
$$\Delta E_i^{1970–1980} = 0.279 + 0.127\Delta C_i + \varepsilon_i$$
$$(0.073)\ \ (0.031)$$
$$\Delta E_i^{1980–1990} = 0.287 + 0.147\Delta C_i + \varepsilon_i$$
$$(0.108)\ \ (0.046)$$
$$\Delta E_i^{1990–1996} = -0.171 + 0.289\Delta C_i + \varepsilon_i$$
$$(0.196)\ \ (0.081)$$

where superscripts on ΔE_i indicate the years over which the change is calculated. How do these results affect your interpretation of the original regression? To what extent do they make you conclude that the original regression is spurious (not causal), and to what extent do they make you conclude that computers did have a causal effect on demand for skilled workers?

4) (25 points) During the period 1910-1940, there was a movement in the United States to make high school attendance the norm for teenagers. Part of this movement was the tightening of *compulsory schooling laws*, which made school attendance mandatory up to a certain age. The minimum age for leaving school was chosen by each state, and many states increased this minimum over 1910-1940. However, there was wide variation in the year that states chose to tighten their laws.

You have a large data set from the 1960 census that gives you each person's state of birth, age, years of education, and earnings in 1960. You also have data on the minimum age at which a person could legally leave school in each year, for each state.

a) (10 points) You first want to estimate the effect of stricter compulsory schooling laws on a person's years of education. Explain the best way you can think of to estimate this effect using the data at your disposal.

b) (10 points) It occurs to you that you might be able to use these data to estimate the effect of education on earnings without ability bias contaminating your results. Explain the best way you can think of to estimate the return to schooling using these data. Why is your approach likely to avoid ability bias?

c) (5 points) Suppose that an individual's return to education is mostly due to signaling, not to the accumulation of human capital. Would you expect your estimate in part (b) to underestimate the individual return, overestimate it, or get it right? (By individual return, we mean the change in earnings one person could expect to get if they decided to stay in school for an extra year.) Explain why.