

First Midterm, Labor Economics, Fall 2006, Wiswall

Instructions: Write all answers on the separate answer sheet (s). Make sure you write your name on each page of your answer sheets. (54 total points)

Short Answer

Instructions: For each question, write a BRIEF response on the separate answer sheet. Your answers should be concise and direct. Your answers should be no more than 3 sentences.

1) In words, describe the production technology of a firm with a labor demand elasticity with respect to wages (ϵ) close to $-\infty$. (4 points)

2) In words, describe the production technology of a firm with a labor demand elasticity with respect to wages (ϵ) close to 0. (4 points)

3) Write the new budget constraint for our labor supply model if we were to allow individuals to borrow or save. Assume that in any period, individuals can borrow b dollars at an interest rate r_b , and save s dollars of their income. (4 points)

4) Explain one way to estimate empirically (using data) how much labor supply would change if the government decided to provide a cash grant type welfare policy of M dollars to all individuals who decide not to work. (5 points)

5) If the rents for all buildings increased in New York, using the concepts in this course, explain what effect this would have on labor demand. (4 points)

Problems

Instructions: For each problem, write your answer on the separate answer sheet. Show at least some work for each problem.

6) Assume the production function for a firm is

$$f(h, k) = 8 + 2k^{1/2} + 4h^{1/2}$$

a) If the firm chooses $k = 4$ and $h = 16$, how much output (q) does the firm produce? (3 points)

b) What is the firm's profit maximizing level of labor demand h^* at $r = 2$, $p = 1$, and $w = 1$. (6 points)

c) If r increases to $r = 4$, compute the new optimal labor demand of the firm h^* . (3 points)

7) Assume an individual has a utility function of this form

$$u(c, l) = 6 + cl$$

The individual has an endowment of V in non-labor income and $T = 16$ hours to either work (h) or use for leisure (l).

- a) How much utility does the individual receive if she consumes $c = 4$ and works $h = 6$ hours? (3 points)
- b) Assume $p = 2$, $w = 1$, and $V = 0$. What is the optimal labor supply of this individual (h^*)? (Your answer should be number.) (6 points)
- c) Write the elasticity of labor supply with respect to the wage rate (γ) as a function of h^* , w , and V . (Your answer should be a function.) (4 points)
- d) Assume a cash grant welfare program is instituted which pays $M = 6$ dollars for individuals who do not work. Compute the new optimal labor supply h^* for this individual under the welfare program. Assume that prior to the welfare program, $p = 2$, $w = 1$, and $V = 0$ (as in part b). Does the individual accept the welfare program and not work? Show why or why not. (8 points)

Answers to First Midterm, Labor Economics, Fall 2006, Wiswall

Instructions: Write all answers on the separate answer sheet (s). Make sure you write your name on each page of your answer sheets. (54 total points)

Short Answer

Instructions: For each question, write a BRIEF response on the separate answer sheet. Your answers should be concise and direct. Your answers should be no more than 3 sentences.

1) In words, describe the production technology of a firm with a labor demand elasticity with respect to wages (ϵ) close to $-\infty$. (4 points)

Answer:

These are firms which quickly adjust to changes in wages by substituting capital for labor. For example, a manufacturing which can quickly use machines to replace labor if the wage increases.

2) In words, describe the production technology of a firm with a labor demand elasticity with respect to wages (ϵ) close to 0. (4 points)

Answer:

These are firms which cannot quickly adjust to changes in wages by substituting capital for labor. For example, a firm like a baseball team which

can cannot respond to rising baseball player salaries by replacing players with machines.

3) Write the new budget constraint for our labor supply model if we were to allow individuals to borrow or save. Assume that in any period, individuals can borrow b dollars, and save s dollars of their income. (4 points)

Answer:

$$s + pc = V + wh + b$$

4) Explain one way to estimate empirically (using data) how much labor supply would change if the government decided to provide a cash grant type welfare policy of M dollars to all individuals who decide not to work. (5 points)

Answer:

Two ways:

1) Specify and estimate a particular utility function and labor supply model. Then use the estimated model to predict the effects of the welfare policy.

2) Use actual policy changes as a “natural experiment.” For example, we could compare labor supply before and after the welfare reform of the 1990s, which lowered welfare benefits.

5) If the rents for all buildings increased in New York, using the concepts in this course, explain what effect this would have on labor demand. (4 points)

Buildings for firms are capital. An increase in the rental rate r of capital could have two effects on labor demand: i) higher r could increase labor demand through substitution effect (firms substitute less expensive labor for more expensive capital), or ii) higher r could decrease labor demand through a scale effect (cost of production is higher because of higher input costs, therefore the firm decreases production q).

Problems

Instructions: For each problem, write your answer on the separate answer sheet. Show at least some work for each problem.

6) Assume the production function for a firm is

$$f(h, k) = 8 + 2k^{1/2} + 4h^{1/2}$$

a) If the firm chooses $k = 4$ and $h = 16$, how much output (q) does the firm produce? (3 points)

Answer:

$$q = f(16, 4) = 8 + 2 * 4^{1/2} + 4 * 16^{1/2} = 28$$

b) What is the firm's profit maximizing level of labor demand h^* at $r = 2$, $p = 1$, and $w = 1$. (6 points)

Answer:

FOC:

$$MRP_h = w$$

$$p4\frac{1}{2}h^{-1/2} = w$$

$$h^{-1/2} = \frac{w}{2p}$$

$$h^{-1} = \frac{w^2}{2^2p^2}$$

$$h = \frac{2^2p^2}{w^2}$$

$$h^* = \frac{4 * 1}{1} = 4$$

Check:

$$1 * 4 * 1/2 * 4^{-1/2} = 2 * 1/2 = 1 = w$$

c) If r increases to $r = 4$, compute the new optimal labor demand of the firm h^* . (3 points)

Answer: Stays the same. $h^* = 4$.

7) Assume an individual has a utility function of this form

$$u(c, l) = 6 + cl$$

The individual has an endowment of V in non-labor income and $T = 16$ hours to either work (h) or use for leisure (l).

a) How much utility does the individual receive if she consumes $c = 4$ and works $h = 6$ hours? (3 points)

Answer:

$$u(4, 16 - 6) = 6 + 4 * 10 = 46$$

b) Assume $p = 2$, $w = 1$, and $V = 0$. What is the optimal labor supply of this individual (h^*)? (Your answer should be number.) (6 points)

Answer:

$$MRS = \frac{w}{p}$$

$$\frac{c}{l} = \frac{w}{p}$$

$$\frac{1}{l} = \frac{w}{pc}$$

$$l = \frac{pc}{w}$$

$$c = V/p + w/p(T - l)$$

$$l = \frac{V + w(T - l)}{w}$$

$$l = V/w + T - l$$

$$l^* = 1/2(V/w + T)$$

$$h^* = T - l^* = T - 1/2(V/w + T)$$

$$16 - 1/2(0 + 16) = 16 - 8 = 8$$

c) Write the elasticity of labor supply with respect to the wage rate (γ) as a function of h^* , w , and V . (Your answer should be a function.) (4 points)

Answer:

$$\gamma = \frac{\partial h^*}{\partial w} \frac{w}{h^*}$$

$$h^* = T - 1/2(V/w + T)$$

$$\frac{\partial h^*}{\partial w} = (-1/2) * (-1) * \frac{V}{w^2}$$

$$\gamma = 1/2 \frac{V}{w^2} \frac{w}{h^*} = 1/2 \frac{V}{w} \frac{1}{h^*}$$

d) Assume a cash grant welfare program is instituted which pays $M = 6$ dollars for individuals who do not work. Compute the new optimal labor supply h^* for this individual under the welfare program. Assume that prior to the welfare program, $p = 2$, $w = 1$, and $V = 0$ (as in part b). Does the

individual accept the welfare program and not work? Show why or why not.

(8 points)

Answer:

Utility from not accepting the welfare program:

From b) above

$$l^* = 1/2(V/w + T) = 1/2(0/w + 16) = 8$$

$$c^* = w/p(T - l^*) = 1/2 * 8 = 4$$

$$u(4, 8) = 6 + 4 * 8 = 38$$

Utility from accepting welfare program:

$$l^* = 16$$

$$c^* = M/p = 6/2 = 3$$

$$u(3, 16) = 6 + 3 * 16 = 54$$

Since utility from accepting welfare is higher than from not accepted welfare, this person will accept the welfare program. Under the welfare program, $h^* = 0$.