

Econ 001: Final Exam (Dr. Stein) Answer Key
May 10th, 2011

Instructions:

- This is a 120-minute examination.
- Write all answers in the blue books provided. Show all work. Use diagrams where appropriate and label all diagrams carefully.
- Write your name and your Recitation Instructor's name in every blue book that you use.
- This exam is given under the rules of Penn's Honor system.
- All blue books, blank or filled, must be handed in at the end of this exam. No blue books may be taken from the room.
- Calculators are not allowed on this exam.

The Exam has 3 parts. You will need 3 blue books. One for each part.

Part I:

Multiple Choice Questions (3 points each/33 points total).

Please write your answers in blue book 1.

1. Currently the unemployment rate is close to 10%. Given this information, which of the following will be true?

- If unemployment decreases the economy will be able to produce outside the PPF.
- If unemployment decreases the economy will move to a different point on the PPF
- Both statements are true.
- Neither statement is true.

2. We are given that the price of corn is \$4 a bushel and that a million bushels are exchanged in the market. We also know that the supply & demand curves are straight lines.

- If we calculate total surplus we will find that the more inelastic the demand is, the larger is total surplus.
- If we calculate producer surplus we will find that the more inelastic the supply is the smaller is producer surplus.

Which of the above statements is true?

- Only i.
- Only ii.
- Both are true.
- Neither is true.

3. We are told that the demand for wheat is elastic. Suppose the price of wheat increases by 50%, we should expect quantity demanded to:

- a. Increase by 50%.
- b. Decrease by more than 50%.
- c. Decrease by less than 50%.
- d. Increase by more than 50%.

4. Using our model of consumer theory, which of the following statements are correct?

- I. If both prices double but income is unchanged, consumption of both goods will go down.
- II. If both prices double but income is unchanged, substitution effect must be zero.
- III. If income doubles and prices are constant the MRS at the consumption point will be unchanged.

- a. I only
- b. II only
- c. III only
- d. I and II
- e. II and III
- f. I and III
- g. I, II and III

5. Assume that a perfectly competitive market for corn is in a long run equilibrium. Now suppose that fixed costs have increased. What will happen to prices in this market?

- a. In short run prices will remain constant.
- b. The long run price will increase.
- c. Both a and b are correct.
- d. Prices will increase in both the short and long run.
- e. Fixed costs will not affect prices, as prices are determined by demand only.

6. Which of the following will NOT experience “tragedy of the commons?”

- a. Electricity provided by a utility company.
- b. Amazon Rainforest.
- c. Wild Chilean Sea Bass.
- d. The Atlantic Ocean.
- e. None of the above.

7. The Environmental Protection Agency (EPA) has warned Company X that if it produces more than the optimal quantity of air pollution, then it will get shut down. Company X has a marginal cost function $MC=15Q$ and demand $P=\$300$. Every unit Company X produces yields 150 dollars worth of air pollution. Which of the following is true? (Note: you may ignore fixed costs)

- a. Company X should produce zero units to satisfy the EPA's demands.
- b. Company X should produce half of its profit maximizing output.
- c. The Social Marginal Cost is modeled as $165Q$
- d. Both a and b are true
- e. Both a and c are true
- f. None of the above is true.

8. Which of the following is not a common characteristic of both a monopolist market and a monopsonist labor market?

- a. Firms have market power.
- b. Equilibrium outcome is inefficient (without regulation).
- c. Impose a price ceiling can increase efficiency.
- d. If firms can price discriminate across consumers (or wages between workers), efficiency will be improved.

9. Bill is trying to convince the owner of a pizza shop to hire him. He argues that he could help the shop sell an additional five pizzas per day at the market price of \$8 each. However, the owner does not hire him. This is likely to be because:

- a. the wage rate is less than \$40 per day.
- b. hiring Bill would involve a negative marginal product.
- c. the wage rate is more than \$40 per day.
- d. the wage rate is less than \$8 per day.

10. Two team members on a crew team, Kate & Pippa, need to decide how much effort to put into a race. Each can choose either effort (E) or shirk (S). The payoff matrix is specified as follows:

		Kate	
		E	S
Pippa	E	Kate: 2 Pippa: 2	Kate: 1 Pippa: 3
	S	Kate: 3 Pippa: 1	Kate: 0 Pippa: 0

Which of the following statements is true?

- I. This game has at least one Nash equilibrium.
 - II. The equilibrium outcome is efficient.
 - III. Pippa will put in effort no matter what Kate chooses to do.
- a. I only.
 - b. II and III.
 - c. I, II and III.
 - d. I and III.

11. Suppose that 3 years from today you will be awarded \$5000. The present value of this award is:

- a. Less than \$5000 if interest rates are positive.
- b. Bigger at 3% interest than at 6% interest.
- c. Bigger at 6% interest than at 3% interest.
- d. Both a and b are correct.
- e. Both a and c are correct.

Answers:

1. d
2. a
3. b
4. e
5. c
6. a
7. b
8. c
9. c
10. c
11. d

This is still Part I: Please answer in blue book 1.

Q1. (30 points) Please show your work!

Changing tastes will effect employment in any particular sector. This question analyzes the impact of changing tastes on the employment in the dairy industry. Please use large and clear graphs as you answer this question. Explanations are an integral part of the answer.

- a. Draw a LARGE standard graph of the supply & demand for dairy workers (labor) in the dairy industry. Please assume demand for labor is downward sloping and the supply of labor is upward sloping. Mark the equilibrium wage rate (w^*) & employment.
- b. Victoria, a student in econ-001, states: “the upward sloping supply of labor makes sense for dairy workers, who are, in general, low paid workers”. What does she mean by this statement?
- c. What is the level of unemployment among dairy workers?

Former President Bill Clinton has adopted a vegan (meat, eggs and dairy free) diet to improve his health. Suppose that his example convinces many Americans to follow and, as a result, the demand for dairy products decreases.

- d. How will this affect the demand for dairy workers? Explain verbally & show graphically.
- e. How will this effect wages, employment & unemployment in this industry? Show graphically.
- f. How would your answers to parts d & e change if you were told that the wage w^* was the legal minimum wage? Show graphically. Feel free to use a new graph to make things clear.

Moran, a vegan herself, points out that there is another input used in the dairy industry and it is cow's milk. She states that taking the milk from the cows is distressing for both cows and calves. If more people follow Clinton's path she hopes fewer cows will be needed in the dairy industry.

- g. Draw a supply and demand graph for dairy cows. Mark the equilibrium price & quantity.
- h. Is the demand downward sloping? Why?
- i. Explain graphically how decreased demand for dairy products will affect their price & quantity of dairy cows. Please ignore any interaction between labor & cows.

Mark, a former econ-001 TA, thinks that dairy farmers have a monopsony in the cow market.

- j. Revisit part i assuming that Mark is correct. Explain, using a new graph, if and how this will change your answer to part i.

Answer Key:

a. as usual.

b. Answer:

Supply of labor will be upward sloping if the substitution effect of higher wages on consumption of leisure dominates the income effect. Economists think this is more likely for low income workers, such as dairy workers.

Points: 5

Understanding this relates to leisure / income model: 1

Substitution effect > income effect: 2

Makes sense for low earners: 2

c. Answer:

Zero. Any worker who wants to work at the going wage rate is working.

Points: 2

d. Answer:

As the demand for dairy products decreases their price, p , will drop. As a result the $MRP(L) = MP(L) * p$ will fall and demand for labor will decrease. Note that this will be a rotation of the curve.

Points: 3

Relate to $MRP=MP \cdot p$: 1 point
Rotation of Demand: 2 point

(Note: a simple shift of the demand curve without relating it to the output market gets zero points, though the students will still earn points for subsequent parts)

e. Answer:

Wages and employment will fall. Unemployment will remain at zero.

Points: 2

W & L: 1

Unemployment: 1

f. Answer:

In this case wages cannot adjust to the new equilibrium. Employment will fall more than before (to where the new demand= w^*) and there will be unemployment (mark graphically).

Points: 3

W & L: 1

Unemployment: 2 (1 for $U > 0$, 1 for showing U graphically)

g. Answer:

Standard demand & supply. X axis market q or cows, Y axis P_c .

Equilibrium Q^* & P_c^*

Points: 2

Axis show understanding: 1

Equilibrium: 1

h. Answer:

As for any input the demand is derived demand such that

$P_c = MRP(c) = MP(c) \cdot P_{dairy}$ It makes sense to assume that the marginal productivity of cows is diminishing in which case demand would be downward sloping.

Points: 3

Need to related D to $MRP(cows)$ and to $MP(cows)$.

No MRP equation means a maximum of 1 point.

Full credit if the student says $MP(c)$ is constant and thus draws a horizontal MRP line.

i. Answer:

Same as parts d & e above.

Points: 2

Rotation of demand: 1

Lower Q & p: 1

j. Answer:

In a monopsony the firm hires input to the point where $MC(\text{input})=P(\text{input})$. So a new graph is *necessary* and must include the $MC(\text{cows})$. Full credit requires 4 steps:

- 1. mark the original monopsony quantity of cows (where $MC(\text{cows})=MRP(\text{cows})$ and price (at $S(\text{cows})$).**
- 2. Rotate demand**
- 3. mark new monopsony quantity of cows (where $MC(\text{cows})=\text{new } MRP(\text{cows})$ and price (at $S(\text{cows})$).**
- 4. Note that the result is similar to part I in that both prices & quantity of cows used is lower.**

Points: 5

1 for each step.

1 point for labeling the graph as “Cows.”

Part II: Please answer in blue book 2.

Q2. (19 points)

Let us revisit, once again, the topic of pricing venue tickets for sports and music events. We will use the case of the Wells Fargo Center, where the 76ers (Philadelphia’s NBA basketball team) plays. As in midterms 1 & 2, we will assume that demand for the games fluctuates depending the team that the 76ers play against.

Once again we will assume that there are 100 seats in the stadium.

Throughout the question assume that the Marginal Cost per person is \$10 and that there are no fixed costs.

- a. When the 76ers play against the Detroit Pistons demand for the games is relatively low. $P=110-Q$ which implies that $MR=110-2Q$. What price should the firm set for these tickets? How many tickets will be sold?
- b. Sean, a consultant hired by the firm says: “At this price there are many empty seats. If the firm would reduce the price of the tickets revenue would increase.” Is

- he correct? Should the firm reduce the price of the ticket? Explain why or why not.
- c. When the 76ers play against the Boston Celtics demand for the games is high. $P=210-Q$ which implies $MR=210-2Q$. What price should the firm set for these tickets? How many tickets will be sold? Are there empty seats in this case?
- d. Is the quantity of tickets sold efficient? Explain why or why not. Be specific about each case (Pistons & Celtics).

Now let us assume that when 76ers fans attend winning games they become better citizens (happy fans spread cheer and make others happy, for example). In particular, each attendee of a winning game brings a \$10 benefit to society. Losing games have **no** impact (i.e., neither good nor bad).

Further, assume that the 76ers win **all** games against the Pistons and **never** win games against the Celtics.

- e. What term would we use to describe the effect of a win? (no need to explain).
- f. Rhodes suggests that to take the effect mentioned in part e into account the city should subsidize each Piston's ticket by \$10. Would you support this suggestion? Explain why or why not.
- g. Adam thinks that subsidizing Pistons ticket will encourage the 76ers to charge less for Celtics tickets too. He calls this effect "cross subsidization". Would you expect this to happen? Explain.

Answer key:

a. The arena sets $MR = 110 - 2Q = 10 = MC$ so $Q^D = 50$ and each ticket is sold for $P^D = 60$.

Points: 2

P & Q: 1 each.

b. Answer:

Sean is correct that there are empty seats: 50 empty seats to be exact. Reducing the price of tickets by a small amount would increase revenue. An unregulated monopolist always produces on the elastic part of the demand curve (where $MR > 0$). However the firm should not reduce the price since profits would fall as a result (MC would then exceed MR). Reducing the price would increase revenues but it would increase costs by even more.

Points:3

Empty seat:1

Lower P → Revenue would increase: 1 oints here are for the explanation and not for simply saying increase or decrease. Student needs to relate the answer to elasticity or the positivity of MR.

Profits will decrease:1

c. Answer:

The arena sets $MR = 210 - 2Q = 10 = MC$ so $Q^C = 100$ and each ticket is sold for $P^C = 110$. In this case there are no empty seats.

Points:2

P & q:1

No empty seats:1

d. Answer:

In part a, the efficient quantity is NOT being sold. The efficient quantity would 100 since the demand curve intersects MC at $Q = 100$. At the current equilibrium MSB does not equal MSC and total surplus is not being maximized.

In part c, the efficient number of seats were being sold (the stadium was full) so the MC pricing rule only serves to redistribute the entire PS to CS, but total surplus is unchanged. (Extensions of this model may worry about losses from search costs that result from the excess demand at $P = 10$ for the Celtics game).

Points: 4

1 for result, 1 for each explanation that makes sense.

e. Answer:

Positive externality.

Points:2

Need exact terminology.

f. Answer:

A subsidy would indeed help internalize the externality. Note however that a subsidy of \$ 10 will not be enough in this case. The firm would produce where $MR' = MC$ or $110 - 2Q + 10 = 10$ so that $Q = 55$, still below the efficient output which in this case is 100.

Points: 4

Subsidy works in the right direction:2

Not sufficient: 2

Many people will only get 2 out of the 4 points on this question.

g. Answer:

If the firm is a profit maximizing firm that price discriminates between these two markets, we should not expect that a change in the MR for one market will effect the other market. The firms should therefore not change its price in the Celtics market. Note that this was the issue explored by Adam H. in his senior thesis that he presented in class.

Points:2

For understanding that there should not be an effect across the separate mkts. Full credit if the student instead gives gives a good explanation of why the mkts are related and specifically talks about consumers “substituting” one game for the other.

Part III: Short Answer Questions 3. Please answer in blue book 3.

Q3. (18 points)

The Town Council of Davie, Florida is considering a proposal to install free public high-speed Wi-fi within the town limits. The cost to install the Wi-fi system is \$500. There are three voting member of the Town Council, each representing a third of the town’s population of 300 people:

- Councilwoman Anne represents the town’s South Side. Each resident there has an income of \$50 and would benefit \$1 from the Wi-fi.
- Councilman Bob represents the town’s Central District. Each resident there has an income of \$200 and would benefit \$3 from the Wi-fi.
- Councilwoman Cathy represents the town’s North Side. Each resident there has an income of \$100 and would benefit \$2 from the Wi-fi.

- a) Is installing the Wi-fi efficient? Why or why not?
- b) Councilwoman Ashley brings up a concern. She claims that residents of the neighboring city of Weston would be able to access Davie’s Wi-fi, if it were

installed. This would end up clogging bandwidth and slowing the connection speeds for Davie's residents. What type of good does Councilwoman Ashley claim Davie's Wi-fi will be? What is the problem with Weston residents' use of Davie's Wi-fi?

Please ignore this issue as you proceed with the question.

Davie's law stipulates that all new public utilities must be paid for by a 1% income tax. At least two of the three Councilmembers, who directly represent the interests of their constituents, must vote in favor for the plan to pass. If the measure passes, all residents of Davie must pay accordingly for the Wi-fi.

c) Will a 1% income tax plan, as required by law, corral enough votes to pass? Who will vote in favor? Who will vote against? Why?

d) If the measure were to pass, would it collect enough money to fund the Wi-fi?

Councilwoman Cathy recommends amending the constitution to allow for a 2% income tax to fund the Wi-fi project.

e) Will enough Council members vote for a 2% income tax to fund the Wi-fi project? Will enough money be collected?

f) How would you find the lowest income tax that would both pay for the project and be approved by at least 2 council members? Show algebraically how to find t. A numeric solution is not required.

Answer Key:

a. Social Marginal Benefit = $100*(1 + 3 + 2) = \$600 > \$500 = \text{Marginal Cost}$ so the Wifi is efficient.

Points: 3

2 for $SMC > MB$

1 for answer

b. Answer:

Councilwoman Ashley claims that the Wi-fi will be a common resource (rival as the extra use decreases the usefulness to others but nonexcludable). Free riding by Weston residents causes the Wi-fi to suffer from the tragedy of the commons and decreases the benefits to residents of Davies.

Points: 4

2 for common resource (or rival & non excludable)
2 for free riding or tragedy of the commons.

c. Answer:

A 1% income tax will require a \$0.50 per person contribution from the south-siders, a \$2 contribution from the central district residents, and a \$1 contribution from the north-siders. All residents would derive benefits that exceed their contributions and thus all of the three council members will support the income tax.

Points:3

d. Answer:

No. The measure will collect $100*(0.50 + 2 + 1) = \$350$ and thus the measure would not be sufficient to fund the Wi-fi.

Points:2

Need to show calculation.

e. Answer:

Doubling all of the contributions, we can see that the representatives from the South side and the North side would support the income tax while the rep from the central district would not. The measure would collect \$750 which would fund the Wi-fi.

Points: 2

Votes: 1

Funded: 1

f. Answer:

The amount of money raised will be given by

$$t*(100*50 + 100*200 + 100*100) = t*100*(350)$$

We then solve for the lowest t as

$$t*100*350 = 500 \Rightarrow t*350 = 5 \Rightarrow t = 1/70.$$

We can compute the contribution of each resident at this tax rate and see if it is lower than their benefit (that is check to see it satisfies each resident's participation constraint or incentive compatibility constraint). As long as the constraint is satisfied for at least 2 groups of residents the measure will pass the Wi-fi will be funded. Note that $1/70 < 1/50 = 2\%$. We know 2 councilman agreed to that rate so we know that at least 2 people will agree to this lower tax rate.

Points:4

2 for setting up budget constraint

2 for setting up IC/participation constraint.

You are done! Have a great summer!