ECON 001
Fall 2019
Final Exam
December 16, 2019
Time Limit: 120 Minutes

Name (Print): _____

Recitation Section: _____

Name of TA: _____

- This exam contains 12 pages (including this cover page) and 17 questions. Check to see if any pages are missing.
- The exam is scheduled for 2 hours.
- This is a closed-book, closed-note exam, no calculator exam.
- Answer each multiple choice question by writing the correct answer on the line at the right margin of the corresponding question. Make sure that your answer is clearly written or it will be marked incorrect.
- Write your answers to the short answer questions in the spaces provided below them. If you don't have enough space, continue on the back of the page and state clearly that you have done so.
- Do not remove any pages or add any pages. No additional paper is supplied
- Show your work when applicable. Use diagrams where appropriate and label all diagrams carefully.
- You must use a pen instead of a pencil to be eligible for remarking.
- This exam is given under the rules of Penn's Honor system.

My signature certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination.

Please sign here _____ Date _____

Question	Maximum	Grade
MC (Q1-14)	39	
1st SA (Q15)	22	
2nd SA (Q16)	17	
3rd SA (Q17)	22	
Total	100	

Multiple Choice Questions (best 13 out of 14: 39 points)

1. (3 points) Pat is going on a trip to tropical Costa Rica during the winter break. For this trip Pat bought a volcano tour for \$100 and values it at \$300. Two days before the tour date, the tour is cancelled due to an unexpected mild eruption. Pat has two options: to retake the tour the next week, but his valuation of the tour will go down to \$150; or to get a 60% refund and a tour to the natural hot springs at no extra cost, which Pat values at \$100. Which option has the *lowest* opportunity cost, and why?

   A. Take the next week volcano tour, because its opportunity cost is \$160.
   B. Get the refund and take the hot springs tour, because its opportunity cost is \$50.
   C. Take the next week volcano tour, because its opportunity cost is \$150.
   D. Get the refund and take hot springs tour, because its opportunity cost is \$150.
   E. Both options have the same opportunity cost.

   1. **D**

2. (3 points) The market for croissants has demand $P = 10 - Q_d$ and supply $P = 4Q_s$. Bakers unionize, so bakeries increase the wages paid to bakers. Which of the following could be a consequence of the wage increase?

   A. The price of croissants falls
   B. The croissant market equilibrium after the wage increase is on a more inelastic portion of the demand curve than the equilibrium before the wage increase.
   C. The croissant market equilibrium after the wage increase is at the unit elastic point on the demand curve
   D. Total consumer expenditures on croissants decreases

   2. **D**

3. (3 points) Tom can choose between two different goods for consumption. Both cost \$4 and he consumes 6 units of each good. Which of the following answers are possible explanations for Tom's consumption choice?

   I. The two goods are perfect substitutes for Tom.
   II. Both goods are inferior.
   III. The two goods are perfect complements for Tom.
   IV. None of the above.

   A. I., II., and III. B. Only I. C. I. and III. D. Only II.

   3. **C**

4. (3 points) Suppose a market for oranges is perfectly competitive. Suppose all farmers have the same short-run total cost $TC(q) = 16 + 10q + q^2$ and marginal cost $MC(q) = 10 + 2q$. Find the difference between the break-even price and the shutdown price, i.e. $p_{BE} - p_{SD}$.

   A. 4
   B. 8
   C. 10
   D. 14

   4. **B**

5. (3 points) Country A produces and consumes two goods, bikes and cars. Currently the world price is such that Country A does not import or export any of the two goods. Due to technological progress in foreign markets, the world price changes. After the price change, Country A produces 180 bikes and 30 cars, while consuming 330 bikes and 20 cars. What happened to the relative price of the two goods?

A. Bikes became relatively more expensive and the new world price is 6 bikes per car.
B. Cars became relatively more expensive and the new world price is 15 bikes per car.
C. Bikes became relatively more expensive and the new world price is 15 bikes per car.
D. Cars became relatively more expensive and the new world price is 6 bikes per car.

5. **B**

6. (3 points) The most popular good in the country Freeca are large televisions. The supply for televisions is $Q_s = P$, the consumers demand them according to $Q_d = 24 - 3P$. So far Freeca has been a closed economy (without international trade). The government recently decided to open the economy of Freeca to international trade, and the world price for televisions is \$5. In order to protect its local producers the government imposes a tariff of \$3. What is the government's revenue with the tariff in place?

A. \$12
B. \$27
C. \$ 0
D. Not enough information

6. **C**

7. (3 points) Consider a perfectly competitive market for Christmas trees such that demand is perfectly elastic, and supply is upward sloping. There are no externalities in the market. The government plans to provide a per-unit subsidy to Christmas tree producers. Which of the following statements about the effects of this policy cannot be true:

A. The subsidy will create a deadweight loss and will reduce total surplus.
B. The subsidy will only increase consumers' surplus.
C. The subsidy will only increase producers' surplus.
D. The quantity sold in the market will increase.

7. **B**

8. (3 points) Suppose the market for apples is perfectly competitive with a downward sloping demand and an upward sloping supply. Because of their nutritional content, the consumption of apples generates an external benefit to society. In order to determine the per-unit subsidy that would lead to the efficient output, the government asks the FDA to estimate the external benefit. But the FDA ends up overestimating the subsidy. Which of the following happens as a result of implementing this subsidy:

I. The price received by sellers falls
II. There is no deadweight loss
III. The equilibrium quantity of apples is higher than the socially efficient quantity

A. I. only B. II. only C. III. only D. I. and II. E. I. and III. F. II. and III. G. I., II. and III.

8. **C**

9. (3 points) Consider a monopoly producing widgets and facing a downward sloping market demand and upward sloping marginal cost. Suppose producing widgets creates pollution. There is no government intervention in the market. The monopolist develops a technology that allows it to perfectly price discriminate against consumers. Which of the following could be true in this market?

A. The perfectly price discriminating monopolist produces the socially efficient quantity
B. The single-price monopolist produces the socially efficient quantity
C. The perfectly price discriminating monopolist produces at a more elastic part of the demand curve than the single-price monopolist.
D. None of the above

9. **B**

10. (3 points) Consider a perfectly competitive industry and a monopolistically competitive industry. Which of the following must be true?

A. Profits are 0 in the long run in both industries.
B. Long run ATC is minimized in both industries.
C. Long run AVC is minimized in both industries.
D. Under monopolistic competition, when firms enter, demand shifts in and becomes more inelastic.

10. **A**

11. (3 points) What is true about the following game?

		Column	
		R	L
Row	T	$8, 8$	$6, 10$
	B	$10, 2$	$4, 4$

I. The game has more than one Nash equilibrium
II. The game has a Pareto Efficient Nash equilibrium
III. The game does not have a dominant strategy equilibrium

A. I. only B. II. only C. III. only D. I. and II. E. I. and III. F. II. and III. G. I., II., and III.

11. **F**

12. (3 points) There are two separate, equally-sized, competitive labor markets in the watchmaking industry: one with Princeton students and one with Penn students. Discriminatory employers in watchmaking believe that Penn students exhibit less marginal productivity than Princeton students. Also, Penn students are enthralled with HBOs program Watchmen and view watchmaking as a very fashionable profession.

How should we expect Penn student wages and employment levels to compare to their Princeton counterparts?

A. Higher wages for Princeton students; lower employment for Penn students
B. Higher wages for Princeton students; the difference in employment is ambiguous
C. The wage difference is ambiguous; the difference in employment is ambiguous
D. The wage difference is ambiguous; lower employment for Penn students

12. **B**

13. (3 points) At wage \$20 per hour, Stephanie would work 30 hours a week. Suppose Stephanie's wage increases to \$30 per hour and she cuts down work to 20 hours a week. Which of the following are true about her leisure / labor trade-off between when her wage increases from \$20 to \$30 per hour? Find all.

I. The income effect dominates the substitution effect of an increase in wage on Stephanie's leisure

II. Stephanie's labor supply curve is upward sloping

III. The price of leisure for Stephanie is now higher than before

A. I. only B. II. only C. III. only D. I. and II. E. I. and III. F. II. and III. G. I., II., and III.

13. **E**

14. (3 points) Suppose the nation Econland is attempting to introduce measures to reduce income inequality. Which of the following would help them reach their goal, and why?

A. Imposing a regressive tax to raise the Gini coefficient
B. Imposing a regressive tax to decrease the Gini coefficient
C. Imposing a progressive tax to raise the Gini coefficient
D. Imposing a progressive tax to decrease the Gini coefficient

14. **D**

Short Answer Questions (61 points total)

To get any point you must show your work.

15. Consider a factory producing cars at a marginal cost $MC = 2Q$ and fixed cost $FC = 200$. The market demand for cars is $P = 60 - Q_d$ and the factory is a monopoly in the market.

    (a) Find the profit maximizing quantity Q^M and price P^M chosen by the monopolist.

    Solution: The quantity that maximizes monopolist's profit is the solution to $MC = MR \implies 2Q = 60 - 2Q \implies Q^M = 15$. We find the price by plugging the quantity into the market demand: $P^M = 60 - 15 = 45$.

    (b) Using your answers from part (a), find the corresponding monopoly profit π^M.

    Solution: The monopoly profit is equal to the producer surplus minus the fixed cost. Producer surplus is the area below the monopoly price and above the marginal cost, equal to $(45 - 30) \times 15 + \frac{30 \times 15}{2} = 30 \times 15 = 450$. Therefore the monopoly profit is $\pi^M = 450 - 200 = 250$

    (c) Suppose the car production process emits harmful pollutants, equivalent to a marginal external cost of \$6 per car. Write the equation of the social marginal cost SMC and find the socially efficient quantity Q^E.

    Solution: The social marginal cost is given by $SMC = MC + 6 = 2Q + 6$. To find the socially efficient quantity, equate SMC to MB. $SMC(Q) = MB(Q) \implies 2Q + 6 = 60 - Q \implies Q^E = 18$

    (d) The government wants to ensure the socially efficient quantity of cars is produced by the profit maximizing monopolist. Should a per-unit tax or subsidy be introduced? Find its amount.

    Solution: $Q^M < Q^E$ so the monopolist under-produces. Therefore, a subsidy must be introduced, such that $MC - s = MR$ at $Q = Q^E = 18$. $2Q^E - s = 60 - 2Q^E \implies 36 - s = 60 - 36 \implies s = 12$ Therefore, the government should introduce a subsidy of \$12 per-unit.

    (e) Now suppose that the monopolist can perfectly price discriminate. The externality is still in place. Should a per-unit tax or subsidy be introduced to achieve a socially efficient quantity? Find its amount.

    Solution: A monopolist that can perfectly price discriminate will produce where MC intersects demand, i.e. $Q = 20$. This quantity is higher than the socially optimal quantity so the government should impose a per-unit tax. In order to achieve the socially efficient quantity, the per-unit tax must be equal to the value of the externality, which means that per-unit tax is \$6.

    (f) Find the total external cost at the socially efficient quantity.

    Solution: The socially efficient quantity is 18 while the externality is \$6 per unit. Therefore, the total external cost is equal to $\$6 \times 18 = \$108$.

16. The 20 doctoral students in the economics department are discussing over whether to get a public coffee machine, which would cost \$150. Ten of them are absolute coffee lovers and the maximum willingness to pay for the coffee machine is \$23 for every one of them. Let's call them "coffee-fellows" henceforth. Five of them would rather make their own tea instead of using the coffee machine and value the coffee machine at only \$2 as they will rarely use it. Let's call them "tea-fellows". Then the remaining 5 people are neutral to both tea and coffee and value the coffee maker at \$12. Let's call them "neutral-fellows".

(a) What are the two characteristics of a public good?

Solution: A public good is:

- it is non-excludable (everyone can use it);
- non-rival (if someone uses it, others can use it as well).

(b) The first proposal is to fund the coffee machine with a flat tax. What is the minimal tax per person required to buy the coffee maker? Who will and who will not support such a tax? Why?

Solution:

- The minimal tax per person is \$150/20 = \$7.50/person.
- Both coffee fellows and neutral fellows are in support of it, since their marginal benefit of the coffee maker is higher than the tax.
- Tea fellows would not support such a tax, since their marginal benefit of the coffee maker is 0, yet they have to pay \$7.50 for it.

(c) A second proposal is a flat tax that only applies to the coffee fellows and neutral fellows. What tax per person will be required? Who will and who will not support such a tax? Why?

Solution:

- The minimal tax per person is 150/15 = \$10/person.
- Everyone in support of it, since their marginal benefit of the coffee maker is higher than the tax.

(d) If a tax proposal only applies to coffee fellows and neutral fellows, what is the problem with it?

Solution: Since a coffee maker is a public good, once bought, it can be used by anyone without exception. This leads to the free-riding problem: neutral fellows and coffee fellows will have an incentive to under-report their willingness to pay in order to avoid paying the tax and still use the coffee machine.

(e) A third proposal is a tax payment that is proportional to the benefit each person receives from the coffee maker. Find the proportion x and the total tax each person will be expected to pay. Who will and who will not support such a tax? Why?

Solution: k must be such that $10 \times 23x + 5 \times 2x + 5 \times 12x = 150 \Leftrightarrow 300x = 150 \Leftrightarrow x = 0.5 = 50\%$

- Each tea fellow will pay \$1.
- Each coffee fellow will pay \$11.50
- Each neutral fellows will pay \$6.
- Everyone is in support of it, since their marginal benefit of the coffee maker is higher than the tax.

17. Consider a perfectly competitive labor market for fast food workers, which is characterized by a downward-sloping labor demand and an upward-sloping labor supply. Assume that the output market for fast food is perfectly competitive with a downward-sloping demand and an upward-sloping supply.

(a) In the labor market for fast food workers, determine the sign of the (individual) substitution effect on leisure, the (market) participation effect on leisure. Given the information above, under what condition can leisure be a normal good?

> **Solution:** When the wage increases, the opportunity cost of leisure increases. Thus **the substitution effect on leisure is negative**. Also as more people want to participate in the labor market, **the participation effect on leisure is negative**. Since the supply of labor is upward sloping, **the total effect on leisure is negative**. Therefore, leisure can be a normal good **if the substitution effect and the participation effect dominate the income effect,** which is positive if leisure is a normal good.

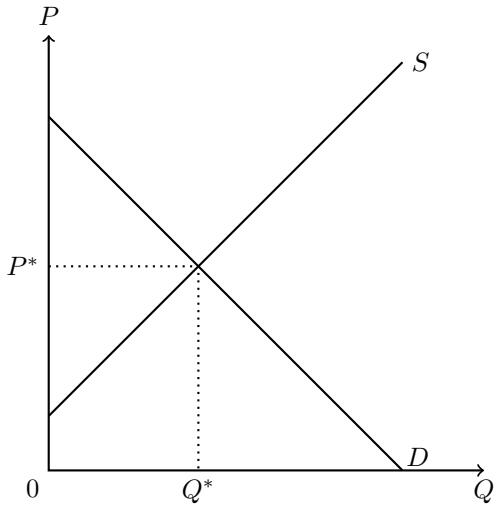
(b) Assume that the labor market for fast food is in the equilibrium. The government wants to impose a minimum wage above the current equilibrium wage. How does this minimum wage regulation affect the wage, employment level, and unemployment level? Explain in words.

> **Solution:** It will **increase the wage** to the minimum wage that is above the current equilibrium wage. Since the labor demand is downward-sloping and the labor supply is upward-sloping, the quantity of labor demanded decreases and the quantity of labor supplied increases. Therefore, it will **decrease employment, and generate unemployment.**

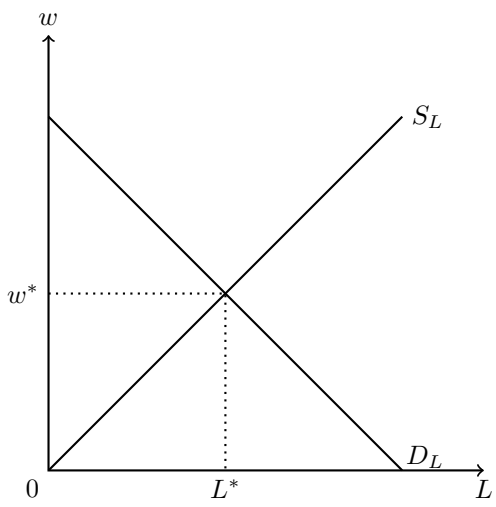
(c) Suppose the government fails to impose the minimum wage. That is, the labor market remains in the initial equilibrium. Suppose that a more health-conscious population changes its eating habits and tends to avoid fast food. Show graphically how this change affects:

- the price and quantity of fast food in the market for fast food
- the wage and employment in the market for fast food workers

Show the first and second-round effects (i.e. the "feedback effect") on the two graphs below (no explanation needed).

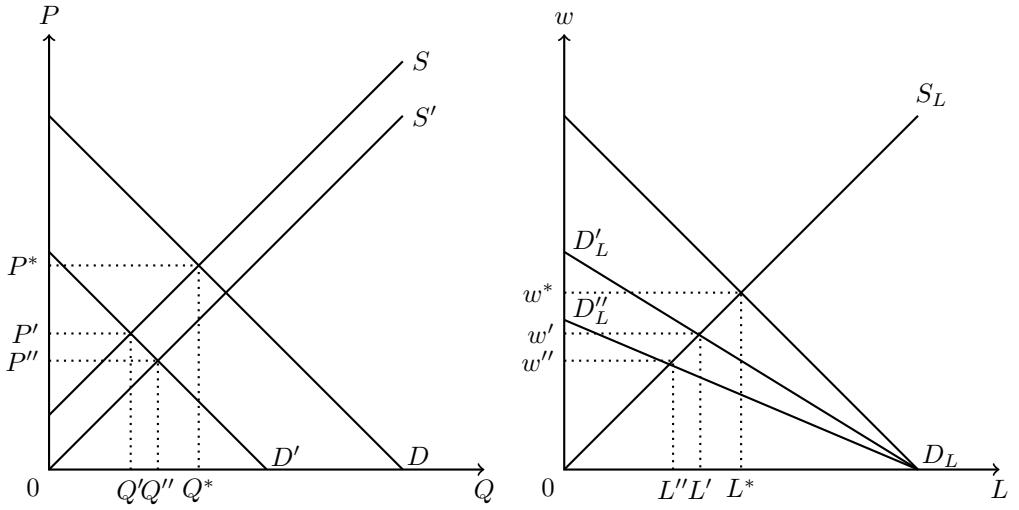


Market for fast food



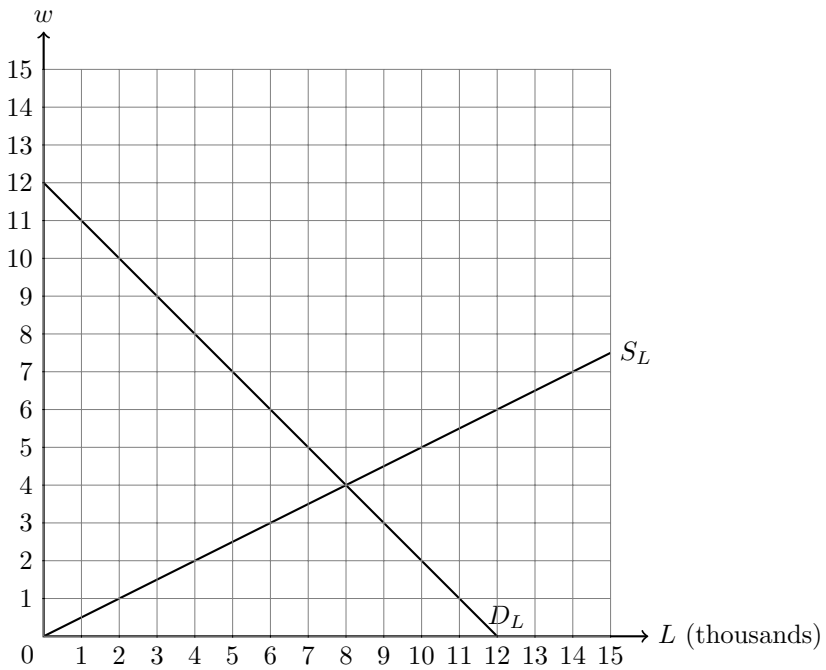
Market for fast food workers

Solution:



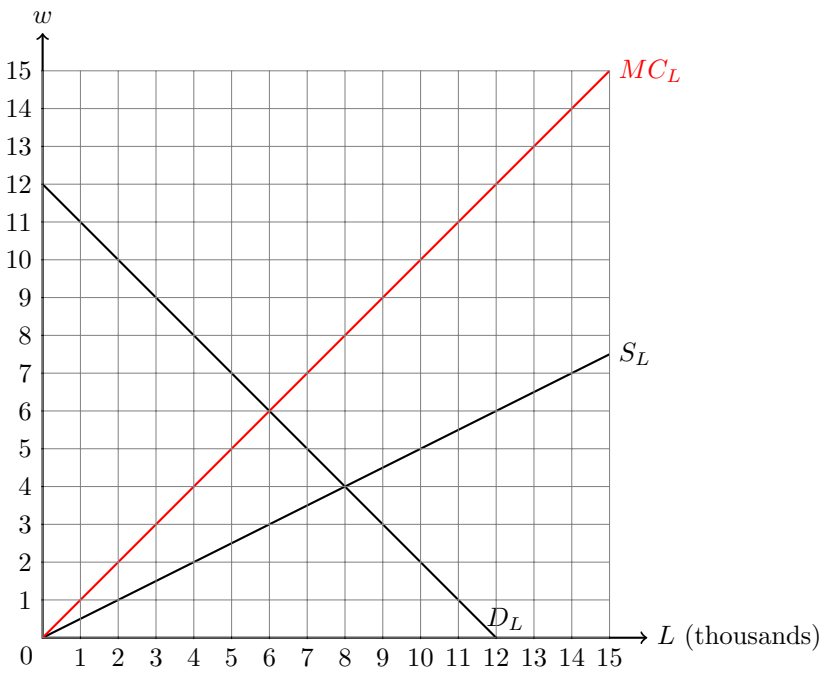
Now suppose that the fast food industry is actually composed of a single firm hiring workers.

(d) On the graph below, draw the marginal cost of labor (MC_L). What are the monopsony wage (w_M), employment level (L_M), and unemployment level (U_M)?



Solution:

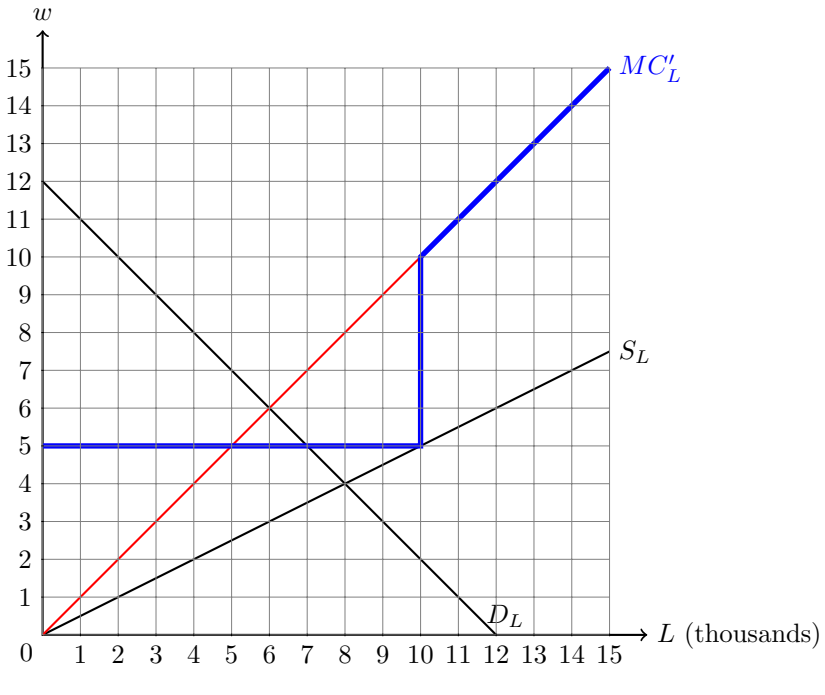
$w_M = \$3$, $L_M = 6$ (thousands), $U_M = 0$



(e) Suppose the government imposes a minimum wage at \$5. Draw the new marginal cost of labor (MC'_L) on the graph above. Find the new wage (w'), employment level (L'), and unemployment level (U').

Solution:

$w' = \$5$, $L' = 7$ (thousands), $U' = L_S - L_D = 10 - 7 = 3$ (thousands)



(f) One of the candidates supports raising the minimum wage further. What would be the impact on employment, unemployment, and efficiency? Explain.

Solution: Raising the minimum wage even further will decrease employment and increase unemployment. It also decreases the total surplus as the level of employment deviates further from the efficient level of employment level.