First Hour Exam
Public Finance - 180.365
Fall, 2005
Answers

1   Multiple Choice - Circle The Correct Letter (4 pts each)

Correct answer indicated by $\Rightarrow$

1. A pure private good is

   (a) nonrival in consumption and subject to exclusion.
   (b) $\Rightarrow$rival in consumption and subject to exclusion.
   (c) rival in consumption and not subject to exclusion.
   (d) all of the above

2. Pareto points in the Edgeworth Box are

   (a) found when indifference curves are tangent.
   (b) found when MRS are equal.
   (c) found when one person cannot be made better off without making another person worse off.
   (d) $\Rightarrow$all of the above.
   (e) none of the above.

3. Points outside the production possibility frontier are

   (a) producable.
   (b) endowment points.
   (c) consumer equilibrium points.
   (d) $\Rightarrow$unattainable.

4. Positive economics

   (a) does not depend on market interactions.
   (b) only looks at the best parts of the economy.
   (c) $\Rightarrow$examines how the economy actually works (as opposed to how it should work).
   (d) is very subjective.

5. The Coase theorem has problems because

   (a) $\Rightarrow$generally, bargaining costs are not zero.
   (b) individuals are not concerned with others.

(c) markets always exist.

(d) all of the above.

6. The marginal rate of substitution is

   (a) the slope of the Pareto curve.

   (b) the slope of the contract curve.

   (c) the slope of the utility possibilities curve.

   (d) ⇒the slope of the indifference curve.

7. The slope of the production possibilities curve is the

   (a) marginal rate of substitution.

   (b) contract curve.

   (c) ⇒marginal rate of transformation.

   (d) offer curve.

   (e) Engel curve.

8. The First Fundamental Theorem of Welfare Economics requires

   (a) producers and consumers to be price takers.

   (b) that there be an efficient market for every commodity.

   (c) that the economy operate at some point on the utility possibility curve.

   (d) ⇒all of the above.

9. Market failure can occur when

   (a) monopoly power exists in the market.

   (b) markets are missing.

   (c) consumers can influence prices.

   (d) moral hazard and adverse selection exist

   (e) ⇒all of the above.

10. A public good is

    (a) a good that the public must pay for.

    (b) ⇒nonrival in consumption.

    (c) more costly than a private good.

    (d) paid for by the government.

11. Movement from an inefficient allocation to an efficient allocation in the Edgeworth Box will

    (a) increase the utility of all individuals.

    (b) ⇒increase the utility of at least one individual, but may decrease the level of utility of another person.

    (c) increase the utility of one individual, but cannot decrease the utility of any individual.

    (d) decrease the utility of all individuals.

12. Points on the utility possibility frontier are

    (a) inefficient.

    (b) points of incomplete preferences.

    (c) not producible.

    (d) ⇒Pareto efficient.

13. Market mechanisms are unlikely to provide

    (a) prices.

    (b) ⇒nonrival goods efficiently.

    (c) supply and demand.

    (d) none of the above.

14. Public goods can be

    (a) provided privately.

    (b) provided publicly.

    (c) subject to free rider problems.

    (d) ⇒all of the above.

15. Externalities can be positive because

    (a) marginal damages do not last over time.

    (b) ⇒utility can be impacted positively as well as negatively.

    (c) there is no concept for marginal benefit.

    (d) positive externalities are subsidies.

16. A Pigouvian subsidy

    (a) cannot exist with externalities.

    (b) is the same thing as a Pigouvian tax.

    (c) is measured in terms of Pigouvian dollars.

    (d) ⇒moves production to the socially optimal level of output

17. Which method can help in obtaining a welfare improvement if externalites exist?

    (a) Pigouvian taxes

    (b) regulation

    (c) assigning property rights and permitting bargaining

    (d) ⇒all of the above

18. Marginal damages

    (a) ⇒must always be considered in social marginal costs.

    (b) must not be considered in social marginal costs.

    (c) must sometimes be considered in social marginal costs.

    (d) have nothing to do with social marginal costs.

19. In a public goods context, it is difficult to measure impact on real income because

    (a) public goods are generally free to the public.

    (b) they make up a small percentage of total GDP.

    (c) ⇒it is hard to measure how people value the public good.

    (d) inflation decreases the value of the good.

20. According to the required reading from the 2003 *Washington Post*, a recent study by the U.S. Office of Management and Budget found that

    (a) ⇒The benefits of tough new clean-air regulations in the past decade were five to seven times greater than their costs

    (b) The most efficient way to control pollution is through Pigouvian taxes

    (c) The 1990 Clean Air Act has not affected the problem of acid rain

    (d) Environmentalists are generally supportive of cost-benefit calculations in assessing environmental policy

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22. According to a required reading from the 2003 *Economist*, the biggest problem facing Indonesia's economy is

    (a) Terrorism

    (b) An organic approach to public policy questions

    (c) ⇒Inadequate rule of law

    (d) Geographical

    (e) Hobbits

23. According to a required reading by P.J. O'Rourke, which of the following statements is false?

    (a) In most of the world, food production has well outpaced the growth of population

    (b) Democracy may be able to help prevent famines from occurring

    (c) In countries experiencing famine, security and order must be established before the famine can be contained

    (d) ⇒Famines are mainly caused by natural disasters or pestilence

24. According to a required reading by P.J. O'Rourke, which of the following statements is false?

    (a) The pesticide DDT may have done more good than harm in some countries before it was banned

    (b) ⇒Despite their other problems, Eastern European countries did a good job protecting the environment during the Communist era

    (c) The costs of environmental regulation exceed their benefits

    (d) Recycling is an economically inefficient way of reducing the human impact on the environment

25. The assigned *Washington Post* Op-Ed by Daniel Chirot can be interpreted as asserting that

    (a) Inadequate education and lack of knowledge of history in the population is why Saddam Hussein's government succeeded in ruling Iraq for so long

    (b) The right way to think about Saddam Hussein's government is basically as if he were the head of a Mafia organization

    (c) ⇒Saddam Hussein's government could be described as adhering to an organic philosophy

    (d) The biggest problem in Iraq under Saddam Hussein was a lack of rule of law

2   Analytical Question

1. Suppose the Silk Road restaurant on the Hopkins campus wants to start selling snails as an appetizer, with a supply curve $Q_s = 3P$ where P is the price the restaurant receives for each snail sold. Snail demand is $Q_d = 12 - 3P$ where P is the price the customer pays per snail. Unfortunately, the restaurant's source of snails is to sneak at night into the Hopkins Upper Quad, where the snails live, and to dig them up out of the ground; digging up each extra snail leaves a small hole in the turf of the quad. Suppose the total monetary value of the displeasure caused to everyone (faculty, students, staff) seeing this little hole is worth $1 per hole. (The Q's are in terms of thousands per year; thus $Q = 1$ means that Silk Road sells 1000 snails per year).

    (a) Calculate the quantity of snails that the free market would produce. (Assume that Silk Road acts competitively, setting supply equal to demand, and nobody can stop them from digging up the snails).

    (20 pts) Answer:
        Set quantity supplied equal to quantity demanded:

$$
\begin{aligned}
Q_s &= Q_d \\
3P &= 12 - 3P \\
6P &= 12 \\
P &= 2 \\
Q_s &= 3P = 6
\end{aligned}
$$

    So they sell 6000 snails per year.

    (b) Suppose the Hopkins administration wants to impose a tax on Silk Road to compensate for the damage caused by digging holes in the quad (which it calls 'hole pollution'). What sort of tax could cause the market to produce the socially efficient quantity of snails? Does it matter whether the tax is applied to the producer or to the consumer? If so, why; if not, why not; in either case, use a diagram to illustrate your answer?

    (20 pts) Answer:
        No, it does not matter whether the tax is applied to the producer or consumer. See the solutions for Problem Set 2 for detail on this.
        Ideally in drawing your diagram you would have drawn an upward-sloping supply curve and downward-sloping demand curve, with shifts of each of them equal to the marginal damage of snail production. This would have shown that the equilibrium quantity of snails produced is the same (i.e. the quantity level where the curves intersect), independent of which curve is shifted. One mistake that many of you made was drawing an upward sloping marginal damage curve - it should have been a horizontal line, since marginal snail damage is constant (it does not get higher as more snails are produced).

(c) What would the optimal tax per snail be? Calculate the socially efficient quantity of snail sales.

(36 pts) Answer:

Recall that the 'socially efficient' level of production is that level at which the social benefits of the extra unit of production exactly equal the social costs of that extra unit.

The theory of Pigouvian taxation proves that if the price paid for a good includes the production cost plus the marginal social damage caused by the production of that good, the market equilibrium will occur at the socially efficient level of production.

The statement of this question said that the displeasure caused to everyone was worth $1. per snail. This is another way of saying that the marginal social damage is constant at $1. (Although we often assume that the marginal social damage of pollution is increasing (as we did with the Burns/Lisa example in class), to make this question as easy as possible we have assumed a constant marginal social damage.)

Our assumption that the supply curve was competitive meant that the price charged for any given quantity of snails equals the private resource cost of producing the snails. Thus, if consumers pay this production cost plus the marginal social damage, $1, for each snail, Pigouvian tax theory says that the market equilibrium will occur at the socially efficient level of production.

The crucial point to realize is that consumers care about the price they have to pay for the snail *including the tax*, while producers care about the amount they *receive* for selling an extra snail, *after the tax has been paid*. If we define P^{received} as the price that Silk Road *receives* for each snail, then the amount each consumer pays (including the tax) is $P^{\text{paid}} = P^{\text{received}} + 1$. Since the consumers will make their spending choices based on the total price they pay for the snail including tax, the demand curve can be written in terms of P^{received} as $Q_d = 12 - 3(P^{\text{received}} + 1)$. Thus we have

$$
\begin{aligned}
Q_s &= Q_d \\
3P^{\text{received}} &= 12 - 3(P^{\text{received}} + 1) \\
6P^{\text{received}} &= 12 - 3 \\
6P^{\text{received}} &= 9 \\
P^{\text{received}} &= 1.5
\end{aligned}
$$

so the received-by-the-producer equilibrium price is $1.50 per snail and the paid-by-the-consumer price is $1.50+$1 = $2.50. The socially efficient quantity of snail production is $Q_s = 3 * 1.50 = 5$ or 4500 snails per year.

(d) Suppose the equilibrium number of snails sold after imposition of the hole pollution tax is some number z. Calculate the total social damage caused by 'hole pollution' and the total revenues generated for the university by the hole pollution tax. What other factor should be taken into account in judging whether snail sales should be allowed?

(20 pts) Answer:

Social damage is z times $1, and revenues raised are z times $1.

The consumer derives more satisfaction from eating the snail than it costs in total social terms, and banning the consumer from buying the snail would reduce his utility by an amount that corresponds to more than the \$1 of tax he would pay. In other words, people wouldn't buy the snails if they didn't like them and weren't willing to pay the 'hole pollution' tax in addition to the production cost, and banning snail sales therefore makes the snail consumers worse off. Of course the hole pollution makes others worse off by \$1 per hole, but that is compensated by the tax of \$1 per hole.
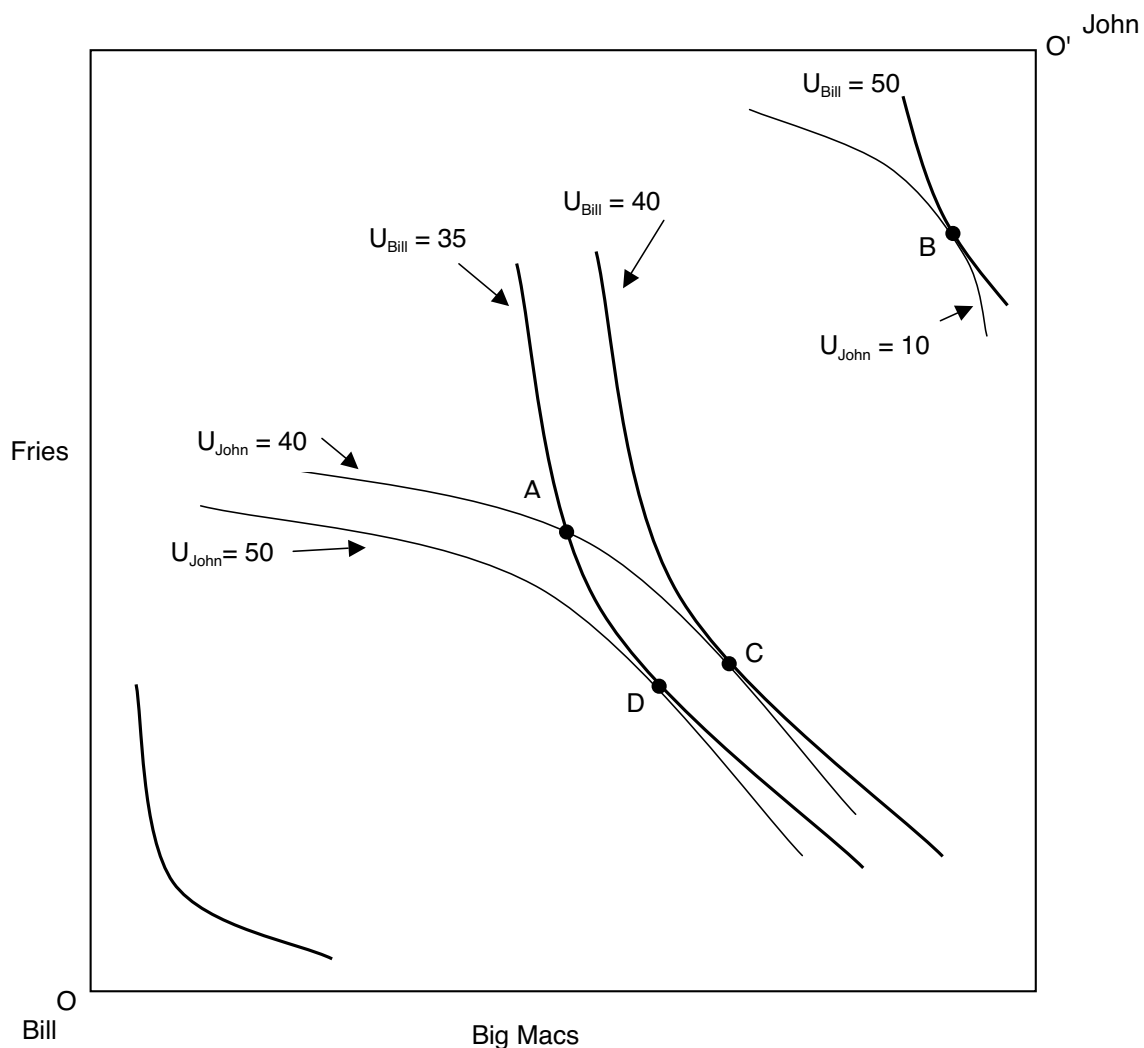
3   Graphical Question

Figure 1

Figure 1 is reproduced from problem set 1. It depicts an economy containing two people, Bill and John, and two goods, Big Macs and Fries.

1. What is the term for a diagram like this? Explain who is happier, Bill or John, at points A, B, C, and D, and say how you know. (You will not get full credit unless you explain your answers).

   (16 pts) Answer:
   This is an Edgeworth Box diagram. It depicts the set of feasible allocations of two goods for two consumers, when there is no production.
   Since the utility level for an individual is equal for all points on his indifference curve, we know the utility levels for both consumers at points A, B, C and D, and these levels can be compared between them in the utilitarian framework that it

is assumed we are working in. So, the happier person is John, Bill, tie, and John, at points A, B, C and D respectively.

2. On the diagram, draw a contract curve that would be consistent with the information contained in the diagram. Pick a point E on your newly drawn contract curve and draw the indifference curves associated with that point. Explain the crucial condition that must be satisfied at point E or any other point on the contract curve, and explain why that condition is necessary for Pareto efficiency.

(16 pts) Answer:

The contract curve is the set of points that are Pareto efficient; i.e. points where the MRS is equal for the two consumers. Any curve that goes from O to O', through D, C and B, and not through any known non-Pareto points would be correct.

The indifference curves for the two consumers must be tangent at your point E. The condition, again, that must be satisfied at all points on the curve is that the MRS's are equal.

This condition is necessary because otherwise the consumers could make a trade that makes them both better off, violating the condition for Pareto efficiency. See problem set solutions for detail on this.

3. From the information presented in the diagram, is it possible to tell whether point A is socially superior to point B or the other way around? Explain.

(16 pts) Answer:

From the information presented it is *not* possible to tell which point is socially superior.

A social welfare function is necessary to determine which point is superior. For example, if the social welfare function were the Rawlsian function point A would be superior, but if the social welfare function were $\max(U_{\text{Bill}}, U_{\text{John}})$ then point B would be superior. Thus, the socially preferable point depends on the welfare function.

Many of you received some points for showing knowledge of the additive and Rawlsian social welfare functions, although you did not realize that you could not necessarily assume the use of one of these two functions.