Homework: Externalities and Public Goods   Economics 304

1) Kansas City is famous for its barbeque. But, good barbeque comes at a cost: Pit masters have to bear the costs of producing slow-roasted pulled pork and beef briskets. There is also an external cost: Every time a pit master roasts another rack of ribs, it offends the sensibilities of nearby animal lovers. Consider the graphical representation of a typical pit master in the competitive BBQ industry below:
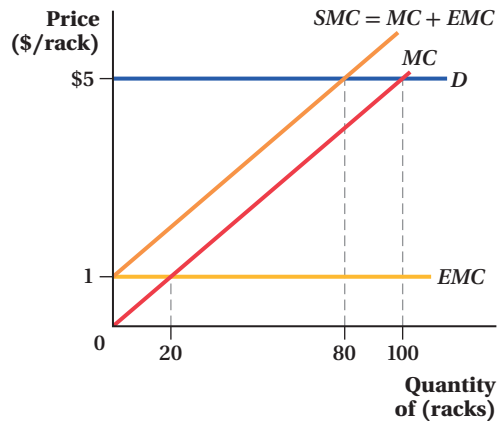
a. What is the market price of barbeque?

$5, the demand curve is perfectly elastic

b. How much psychic damage (external cost) do animal lovers suffer for each rack roasted?

$1 regardless of the number of racks roasted

c. If our pit master accounts only for her private costs, how many racks will she roast? How much total damage will animal lovers suffer?

100, the intersection of MB(demand) and MC

Animal lovers suffer a damage of $1 per rack, totaling $100

d. If our pit master feels sympathy for animal lovers and wholly considers their feelings in her decision about how many racks to produce, how many racks will she roast?

80, the intersection of the social marginal cost and demand

e. Does the decision to consider animal lovers' feelings eliminate the damage they suffer from transactions in the rib market?

No, they would still suffer a total damage of $80, $1 for each of the 80 racks in part d

f. Cutting output *below* the level you determined in (d) clearly benefits animal lovers. Who is hurt by such a decision? Explain why such an output cut would not be Pareto efficient, that is, there is another allocation that would make someone better off without making anyone worse off.

> **Pareto efficient: is a situation where no individual can be better off without making at least one individual worse off.**

> **Cutting output any further would hurt the pit master, who would lose profit. Such a cut would not be Pareto optimal / efficient, even though cutting output would reduce the damage to animal lovers by $1 per rack. Below 80 units any output cut will cost the pit master more than $1 in lost profit.**

2. Suppose that growing flowers produces both a positive externality (people in the neighborhood get to view the flowers) and a negative externality (the flowers aggravate peoples' allergies).

a. True or false, and explain your answer (using a diagram): We can say for sure that too many flowers are being produced.

> **False, it depends on the relative size of each externality.**

Price

SMC

MC

P^*

P_{MKT}

SD

D

Quantity
of flowers
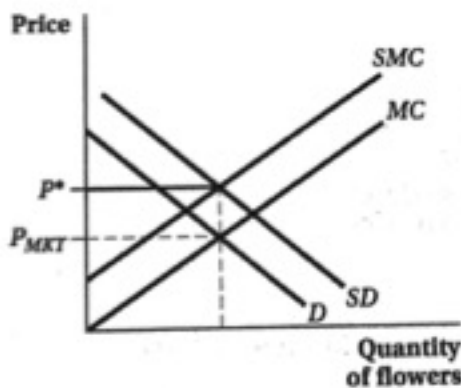
b. True or false, and explain your answer (using a diagram): We can say for sure that the market price of flowers is too high.

> **False, the market price is always too low because both externalities move "up" the curves.**

3) Gasoline brings great benefit to those who buy it, but burning it also creates external costs. Consider the graph below, which shows the demand for gasoline, the private marginal cost of producing gasoline, and the social marginal cost of producing gasoline.

Price
($/gallon)

SMC_1

D

A

MC_1

P_2

H

B

F

P_1

G

C E

D

Q_2 Q_1

Quantity of
gasoline
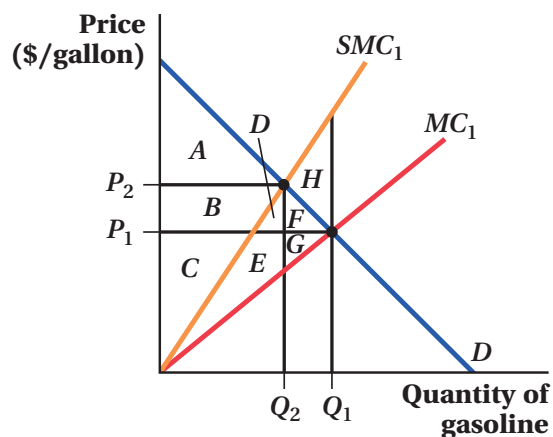
a. Suppose that buyers and producers of gasoline do not consider the external marginal costs they impose on others. Determine the equilibrium quantity and price; then use the letters in the diagram to fill in the appropriate spaces in the table below:

	External Marginal Cost NOT Considered	External Marginal Cost Considered
Consumer Surplus	A + B + D + F	A
Producer Surplus	C + E + G	B + C + D + E
External Damage	D + E + F + G + H	D + E
Total Net Value to Society	A + B + C - H	A + B + C

b. Suppose that conscientious sellers, out of the sheer goodness of their hearts, decide to incorporate external marginal costs into their production decisions. Determine the new quantity (*Hint:* Use the social marginal cost curve) and price, then use the letters in the diagram to fill in the appropriate spaces in the table on the previous page. (Be sure to remember that producer surplus is the area above *private* marginal cost and below the price, out to the relevant quantity.)

c. Producers rarely do something out of the goodness of their hearts, and are likely to consider only their private marginal costs. Compare total surplus in both cases to determine the deadweight loss of the externality when external marginal costs are not considered.

As indicated in the table, the total net value is lower by H. Thus, H is the deadweight loss.

4. Two pink slime producers, XL and IPSP, are located in an otherwise pastoral mountain town. Each producer emits 30 tons of ammonium hydroxide into the atmosphere each year. City planners wish to cut the level of ammonium hydroxide pollution to 50 tons overall.

a. Alfred B. Packer steps forward with the following suggestion. "Make each firm cut emissions by 5 tons. That seems fair, doesn't it?" Do you agree? Explain your answer.

> **It may not necessarily be fair as the cost of cutting emissions may be distinct for each of the 2 firms.**

b. Suppose that XL and IPSP are both capable of reducing emissions by 5 tons, but that it costs XL $50, and IPSP $100, to clean up each ton of emissions. Comment on the fairness of Packer's proposal in light of this additional information.

> **The additional information supports the claim of the proposal not being fair. It will be twice as expensive for IPSP to cut emissions compared to the cost faced by XL.**

c. If you were the "King or Queen of the World" and hoped to clean up the ammonium hydroxide at the lowest possible cost, how would you split the burden of the cleanup between XL and IPSP?

> **Assuming that it is always cheaper for XL to cut emissions than it is for IPSP, the efficient way to cut emissions is to make XL responsible for all the cuts.**

d. Suppose the city goes to a tradable permits system for reducing ammonium hydroxide emissions. It prints 50 permits, each of which gives the bearer the right to emit 1 ton of ammonium hydroxide. It then distributes 25 permits each to XL and IPSP, and informs both that they are free to buy and sell the permits to each other.

i. When permits are traded, who will be the likely buyer of permits, and who will be the likely seller? Explain.

> **Trading permits allows firms that face lower abatement costs to shoulder more of the emissions cutting burden, while giving them a way to be compensated for the additional abatement effort. XL will be the seller. The high-abatement-cost firm, IPSP, is likely to be the buyer, because its cheaper to pay XL than to cut its emissions directly.**

ii. What is the lowest price that you expect pollution permits to sell for? **$50**
iii. What is the highest price you expect pollution permits to sell for? **$100**
iv. When trade is complete, how many permits do you expect to see sold?

> **Permit trading will stop once the cleanup is complete. XL will clean up 5 tons directly, and IPSP will pay XL to clean up another 5 tons on IPSP's behalf. Thus, 5 permits will be sold.**

v. Under the tradable permits system, how much of the cleanup does XL end up being responsible for? How does this outcome compare to your answer to (c)?

> **XL ends up being responsible for 10 tons of the cleanup. This result is consistent with C.**

5. Al regularly rehearses accordion music on his back deck with members of his musical troupe, the Starland Polka Band. Practicing on his deck saves him the $500 per year it would take to rent a

rehearsal space. Unfortunately, practicing on his deck keeps his neighbor, Marcy, awake at night. The value of Marcy's lost sleep is $600 per year.

a. Is it efficient for Al to rehearse on his back deck? Explain your answer.

> **No. rehearsing on the deck brings Al $500 of benefits, but $600 cost to Marcy. Society loses $100 in value.**

b. If the law says that it is illegal for Al to rehearse on his back deck, will Al end up practicing there? What might Marcy do to try to stop him?

> **Marcy can simply call the police.**

c. Suppose that the law says it is legal for Al to rehearse on his back deck.

> i. How much is Marcy willing to pay to get him to stop? **Up to $600**
> ii. What is the minimum amount of money Al is willing to accept in exchange for his silence? **$500**
> iii. If possible, craft a bargain between Marcy and Al that results in his silence. Show that the bargain (if possible) makes both parties better off.

> **One option: Marcy offers $550 and its in Al's interest to accept**

d. Given your answers to (b) and (c), does the out- come of this conflict depend on the law? Is the outcome consistent with your answer to (a)?

> **The outcome doesn't depend on the law. When Marcy has the right for quiet, then she calls the police to stop the music. When Al has the right to play, Marcy can pay him enough to entice him to not play. This results in the same outcome.**

e. Suppose that instead of doing $600 damage to one neighbor, Al does $1 damage to 600 neighbors. Are those 600 neighbors as likely to be able to convince him to stop as easily as Marcy can? Explain.

> **It will be more difficult for the neighbors to organize and to gather the amount needed to compensate Al. Neighbors will try to avoid paying and free-ride. Thus, even though it's not efficient, Al playing on the back deck is a likely outcome.**

6. Classify each of the following goods using these terms: nonrival, nonexcludable, private good, public good, and common resource.
a. Hamburger – **private**
b. Lighthouse - **public**
c. Flood control - **public**
d. Swimming pool - **private**
e. Park – **common resource**
f. Broadcast television – **public**
g. Cellular telephone service – **club good**
h. Computer software – **either a club good or private**

7. A home-team baseball victory produces benefits for residents (in terms of hometown pride) that is both nonrival and nonexcludable. The graph below depicts the marginal benefits that Beatrice, Edward, and Charlotte (the residents of a very tiny town indeed) receive from home-team wins. The graph also depicts the marginal costs of achieving each victory.
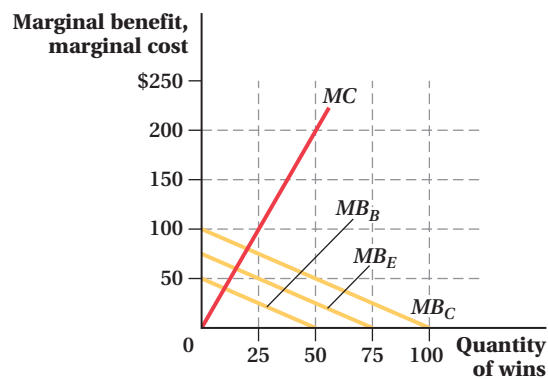
a. Draw the total marginal benefit received by hometown residents. Graph your result carefully.
b. Determine the socially optimal number of wins. Indicate this amount on your graph.

The socially optimal number of wins is 50