Cason Konzer ECN 370 Homework #2, Fall 2022

Tuesday, September 20, 2022 8:58 AM

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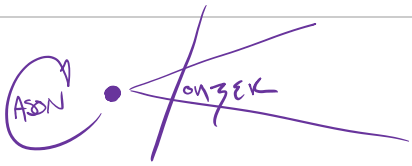

ECN 370
Homework 2
Due: Tuesday, September 27th by the end of the day

Directions: Please complete this homework on a separate piece of paper and email your answers to me at ccdougla@umich.edu. A .pdf file is preferred, though any file works in practice.

1. Tommy Tutone produces and markets "Jenny" brand tequila. Tommy estimates that the market demand curve for Jenny tequila in Flint, Michigan to be: $PMB = 50 - Q$. Recall that the demand curve is also the private marginal benefit (PMB) curve. Suppose Tommy's private marginal cost (PMC) is given by: $PMC = 4Q$, where Q is the number of bottles made

   a. What is the market equilibrium quantity of tequila sold? **Hint:** Recall that supply equals private marginal cost, and that equilibrium is found by setting supply equal to demand.

   b. Oh no!!! Tommy found an edge in the tequila market by including extra worms in each bottle. But, the worms cause some people to go crazy and damage stuff. Suppose that marginal damage is a constant $5. An important, but often overlooked, property of externalities is that something is a negative externality **only** if it damages **someone else's** property. If the tequila drinker goes crazy and damages his or her **own** property, this isn't an externality.

      The above description says that the marginal damage from each bottle produced is: $MD = 5$. What is the efficient quantity?

   c. Can you propose a Coase solution to this externality? Be clear about who has property rights? Do you think a Coase solution possible? Why or why not?

   d. You are a member of the Flint City council. Propose a policy that will bring the market equilibrium quantity into line with the efficient quantity?

2. Suppose there are two factories in town, Factory A and Factory B, that each emit 80 units of pollution into the air. Thus, there are a total of 160 units of pollution in the air in the town, and this makes the townspeople sick. Suppose the marginal benefit of reducing pollution is constant and given by $SMB = 260$.

   a. The total marginal cost of reducing pollution for the two factories is $SMC = 2Q^{TOT} + 40$, where Q^{TOT} is the total reduction in pollution. What is the optimal quantity of pollution reduction? What will the level of

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pollution be in this town after the reduction? **Hint:** Recall efficient reduction occurs where SMB=SMC, namely the marginal benefit of reduction equals the marginal cost of reduction.

b. Suppose that the two factories are different. The marginal cost of Factory A reducing pollution is $PMC^A = 50 + 3Q^A$ and the marginal cost of Factory B reducing pollution is $PMC^B = 20 + 6Q^B$, where Q^A is the amount that Factory A reduces pollution by and Q^B is the amount Factory B reduces pollution by. Explain why it is inefficient for the town to force each factory to reduce pollution by the same amount. That is, why is it inefficient for each factory to reduce its pollution by half of the total amount of the reduction found in part a)?

To answer this, compare the cost to society if each factory reduces by the same amount along with the cost to society if factory A reduces by one more unit and factory B reducing by one fewer amount than the previous case. That is, what is the marginal cost to each factory when reducing the last unit of pollution? Add those two costs together. What would the marginal cost to factory A be if it reduces by 1 additional unit and what would the marginal cost to factory B be if it reduces by 1 fewer unit. Add those two costs together. You should find that the same amount of pollution is reduced as before, but at a lower cost. Note that if it helps you think through this problem, you can think of Factory A as being the new factory from the example discussed in class with Factory B being the old factory.

c. Explain how the social optimum can be achieved if the two factories are given equal numbers of pollution permits but are allowed to buy and sell them to each other. A pollution permit entitles the holder of the permit to emit one unit of pollution. Who buys the permits, who sells them? What would be a price that one pollution permit sells for? How many permits will be bought and sold in total?

d. If the permits are bought and sold, how many permits does Factory A get? How many permits does Factory B get? **Hint:** recall from the graph we discussed in class that in equilibrium under a tradable permit scheme that $SMB=PMC^A$ and $SMB=PMC^B$.

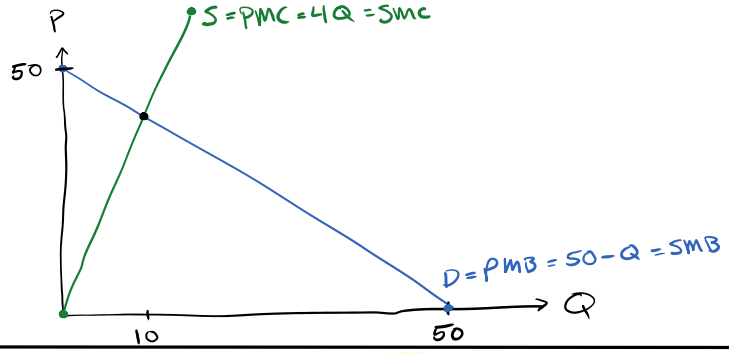
e. Can the social optimum be achieved using a tax on pollution instead? Explain. **Hint**: What did we say in class that the tax is set equal to? When is it cheaper for a factory to reduce pollution rather than paying the tax? When is it cheaper for the factory to just pay the tax? Use the formulas for each factory's *PMC* to answer.

3. Some scientists believe that caffeine is a highly addictive drug. And, caffeine is found in a lot of beverages such as coffee, tea, soda pop, and energy drinks. Yet unlike cigarettes, there have been very few (if any) calls to tax caffeine, to regulate its consumption, or limit its use in public places.

   a. Why do you think that this difference exists?

   b. Can you think of any economic arguments for taxing or regulating the use of caffeine? Explain your reasoning.

1. Tommy Tutone produces and markets "Jenny" brand tequila. Tommy estimates that the market demand curve for Jenny tequila in Flint, Michigan to be: $PMB = 50 - Q$. Recall that the demand curve is also the private marginal benefit (PMB) curve. Suppose Tommy's private marginal cost (PMC) is given by: $PMC = 4Q$, where Q is the number of bottles made



a. What is the market equilibrium quantity of tequila sold? **Hint:** Recall that supply equals private marginal cost, and that equilibrium is found by setting supply equal to demand.

$PMC = 4Q = 50 - Q = PMB$; $5Q = 50$; $Q = 10$

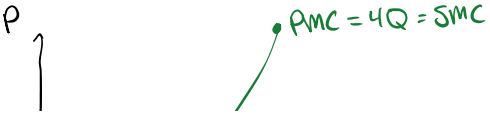
The market equilibrium quantity of tequila is **10 bottles.**

b. Oh no!!! Tommy found an edge in the tequila market by including extra worms in each bottle. But, the worms cause some people to go crazy and damage stuff. Suppose that marginal damage is a constant \$5. An important, but often overlooked, property of externalities is that something is a negative externality **only** if it damages **someone else's** property. If the tequila drinker goes crazy and damages his or her **own** property, this isn't an externality. → Only Externality if the drinker causes Social Damage to Others.

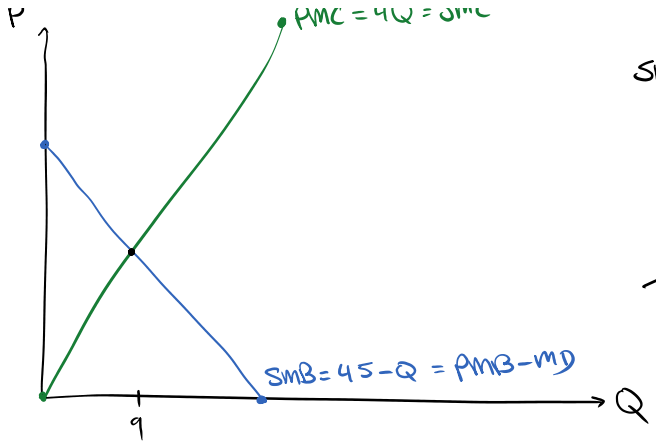
Damaging their own property could though cause an externality on their neighbors.

The above description says that the marginal damage from each bottle produced is: $MD = 5$. What is the efficient quantity?

↓ Negative Consumption Externality ⇒ SMB = PMB − MD



$SMC = 4Q = 45 - Q = SMB$



$SMC = 4Q = 45 - Q = SMB$

$5Q = 45 \Rightarrow Q = 9$

The Efficient Quantity of Tequila is **9 bottles**

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c. Can you propose a Coase solution to this externality? Be clear about who has property rights? Do you think a Coase solution possible? Why or why not?

A Coase Solution should be possible; Always this should be the case, Although with a various Level of Complexity

Some proposed solutions Are as follows:

- Drinking Buddies of the "Crazy" pay $5 per bottle to the owner of the damaged property in exchange for the Nights Entertainment.

*Assume a bar is the owner of the damaged property

- The Bar charges an extra $5 per bottle
- The Bar Bargains with The Seller to get a $5 price reduction or otherwise stops selling Jenny.

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d. You are a member of the Flint City council. Propose a policy that will bring the market equilibrium quantity into line with the efficient quantity?

Speaking on behalf of Alcohol policy I propose the City Tax $5 Per Bottle of Tequila sold such that Consumers Internalize The Externality

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2. Suppose there are two factories in town, Factory A and Factory B, that each emit 80 units of pollution into the air. Thus, there are a total of 160 units of pollution in the air in the town, and this makes the townspeople sick. Suppose the marginal benefit of reducing pollution is constant and given by $SMB = 260$.

Total Pollution

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a. The total marginal cost of reducing pollution for the two factories is $SMC = 2Q^{TOT} + 40$, where Q^{TOT} is the total reduction in pollution. What is the optimal quantity of pollution reduction? What will the level of pollution be in this town after the reduction? **Hint:** Recall efficient reduction occurs where SMB=SMC, namely the marginal benefit of reduction equals the marginal cost of reduction.

$SMC = 2Q^{TOT} + 40 = 260 = SMB$

The optimal reduction is 110 units of pollution. The resulting new level of

reduction equals the marginal cost of reduction.

$SMC = 2Q^{TOT} + 40 = 260 = SMB$

$2Q^{TOT} = 220$

$Q^{TOT} = 110$

Total Pollution $- Q^{TOT} = 160 - 110 = 50$

110 units of [illegible]

The resulting new level of pollution will be 50 units.

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b. Suppose that the two factories are different. The marginal cost of Factory A reducing pollution is $PMC^A = 50 + 3Q^A$ and the marginal cost of Factory B reducing pollution is $PMC^B = 20 + 6Q^B$, where Q^A is the amount that Factory A reduces pollution by and Q^B is the amount Factory B reduces pollution by. Explain why it is inefficient for the town to force each factory to reduce pollution by the same amount. That is, why is it inefficient for each factory to reduce its pollution by half of the total amount of the reduction found in part a)?

To answer this, compare the cost to society if each factory reduces by the same amount along with the cost to society if factory A reduces by one more unit and factory B reducing by one fewer amount than the previous case. That is, what is the marginal cost to each factory when reducing the last unit of pollution? Add those two costs together. What would the marginal cost to factory A be if it reduces by 1 additional unit and what would the marginal cost to factory B be if it reduces by 1 fewer unit. Add those two costs together. You should find that the same amount of pollution is reduced as before, but at a lower cost. Note that if it helps you think through this problem, you can think of Factory A as being the new factory from the example discussed in class with Factory B being the old factory.

We have show that is is cheaper to reduce the same Amount of Pollution Given $Q^A > Q^B$.

If Each Factory Reduces 55 units,

$SMC = PMC^A + PMC^B =$

$50 + 20 + 3(55) + 6(55)$

$= 70 + 165 + 330 = 565$

Now Assume $Q^A = 54$ & $Q^B = 56$;

$SMC = 70 + 162 + 336 = 568$

Last Assume $Q^A = 56$ & $Q^B = 54$;

$SMC = 70 + 168 + 324 = 562$

It is Easy to see that an Equal Amount of Pollution Reduction is not Efficient.

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c. Explain how the social optimum can be achieved if the two factories are given equal numbers of pollution permits but are allowed to buy and sell them to each other. A pollution permit entitles the holder of the permit to emit one unit of pollution. Who buys the permits, who sells them? What would be a price that one pollution permit sells for? How many permits will be bought and sold in total?

Solve $PMC^A = SMB$ & $PMC^B = SMB$

$\begin{cases} 50 + 3Q^A = 260 \\ 20 + 6Q^B = 260 \end{cases}$

$\begin{cases} 3Q^A = 210 \\ 6Q^B = 240 \end{cases}$

$\begin{cases} Q^A = 70 \\ Q^B = 40 \end{cases}$

The Social Optimum Can Be Achieved by a tax or a Cap-n-Trade system. Under a cap & trade system each Factory is given 55 permits. Optimally Factory A reduces 70 units & Factory B reduces 40 units. Thus Factory A sells (55-40) 15 permits to Factory B. Factory A charges $260 per permit as charging more will have them polluting more & selling less at a loss, while charging more will have them polluting less & selling more at a loss.

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d. If the permits are bought and sold, how many permits does Factory A get? How many permits does Factory B get? **Hint:** recall from the graph we discussed in class that in equilibrium under a tradable permit

d. If the permits are bought and sold, how many permits does Factory A get? How many permits does Factory B get? **Hint:** recall from the graph we discussed in class that in equilibrium under a tradable permit scheme that $SMB=PMC^A$ and $SMB=PMC^B$.

From Above Factory A consumes (55-15) 40 units &
Factory B consumes (55+17) 70 units.

e. Can the social optimum be achieved using a tax on pollution instead? Explain. **Hint**: What did we say in class that the tax is set equal to? When is it cheaper for a factory to reduce pollution rather than paying the tax? When is it cheaper for the factory to just pay the tax? Use the formulas for each factory's *PMC* to answer.

Yes The same can be achieved via a Tax. (A tax of $260 per unit of pollution)

For Factory A it is cheaper to reduce pollution when they are producing 11 or more units

1 1 B 1 1 1 1 1 1 1 1 1 41 1 1 1

For Factory A it is cheaper to pay the tax when they are producing 10 or more units

1 1 B 1 1 1 1 1 1 1 1 1 40 1 1 1

3. Some scientists believe that caffeine is a highly addictive drug. And, caffeine is found in a lot of beverages such as coffee, tea, soda pop, and energy drinks. Yet unlike cigarettes, there have been very few (if any) calls to tax caffeine, to regulate its consumption, or limit its use in public places.

a. Why do you think that this difference exists?

The total Effect of Caffeine is a Net Social Positive.

E.g. → Damages done by Addiction are minimal compared to Productivity Gains.

b. Can you think of any economic arguments for taxing or regulating the use of caffeine? Explain your reasoning.

If Caffeine Causes Health Effects Causing a consumption Externality one could Argue the consumer should internalize the Externality.

→ Example that Caffeine products are sold in Cans, then the Cans Are Littered.