

Take Home Quiz #1
DUE AT THE BEGINNING OF CLASS ON MONDAY, FEBRUARY 28

This quiz is intended as an individual take-home quiz. Each student is expected to hand in his/her own work. While you are free to consult with me for any questions you may have, you may not discuss the exam with other students. E-mail questions about the exam should be sent to my personal e-mail address (dcpopp@syr.edu), rather than the class listserv. This is an open-book quiz. You are free to consult your notes and the readings from the class to complete the quiz.

The quiz is due AT THE BEGINNING OF CLASS on MONDAY, FEBRUARY 28. Late exams give you an unfair advantage over other students in the class. As a result, late exams will be marked down one grade for each day late, starting AT THE BEGINNING OF CLASS on MONDAY, FEBRUARY 28. If you will not be in class on Monday, it is your responsibility to get the exam to me BEFORE CLASS. Do not just leave the exam in my mailbox, as I need to know when you hand the exam in. There is a sign-in sheet at the front desk of CPR for this purpose.

This exam has two parts. Each part asks you to compare different strategies for regulating three firms that are currently emitting 15 tons of pollution per week. The marginal abatement costs for each firm are as given on the next page.

ABATEMENT COST SCHEDULES

Source A		
Emissions (tons/week)	Abatement (tons/week)	MAC/week
15	0	\$0
14	1	\$2,000
13	2	\$3,000
12	3	\$4,000
11	4	\$6,000
10	5	\$8,000
9	6	\$11,000
8	7	\$15,000
7	8	\$19,000
6	9	\$25,000
5	10	\$32,000
4	11	\$38,000
3	12	\$45,000
2	13	\$54,000
1	14	\$65,000
0	15	\$80,000

Source B		
Emissions (tons/week)	Abatement (tons/week)	MAC/week
15	0	\$0
14	1	\$1,000
13	2	\$2,000
12	3	\$3,000
11	4	\$4,000
10	5	\$5,000
9	6	\$7,000
8	7	\$9,000
7	8	\$11,000
6	9	\$14,000
5	10	\$17,000
4	11	\$21,000
3	12	\$25,000
2	13	\$29,000
1	14	\$34,000
0	15	\$40,000

Source C		
Emissions (tons/week)	Abatement (tons/week)	MAC/week
15	0	\$0
14	1	\$3,000
13	2	\$6,000
12	3	\$10,000
11	4	\$15,000
10	5	\$20,000
9	6	\$26,000
8	7	\$33,000
7	8	\$40,000
6	9	\$49,000
5	10	\$60,000
4	11	\$70,000
3	12	\$82,000
2	13	\$94,000
1	14	\$107,000
0	15	\$120,000

Part A

As head of the local office of the Department of Environment, you have been asked to compare alternative policies designed to reduce emissions from these three local polluters. In addition to the above information on marginal abatement costs, a recent study estimates that the marginal damage per ton of pollution emitted from any of these three sources is \$21,000 per week. Your analysis should include the following:

1. First, determine what the overall emissions target should be. Given the above information, what is the efficient total level of pollution across all three sources? As a result, how much total pollution abatement is required? (*Hint: As a first step, find the combined marginal abatement cost of the three firms by finding the cheapest way to abate each ton. Compare this information to the marginal damages.*)
2. Having determined the overall emissions target, you are next asked to compare three different policies designed to achieve that target.
 - A command-and-control policy where the total abatement required is shared equally between the three firms
 - Allocating emissions permits equally among the three polluters that can be bought and sold by each firm
 - An emissions fee designed to achieve the total required abatement

Please include a table that shows the following for each policy:

- the amount of emissions abated by each firm
- the marginal cost of abatement for each firm
- the total benefit of each policy (e.g. the total damage avoided by the abated pollution)
- the total cost of abatement for each of the three firms, as well as the total for all three firms combined
- the net benefit of each policy

In addition, the following policy-specific information should also be provided:

- The price that you expect permits will sell for under the tradable permits policy
 - The emission fee per ton necessary to achieve the target
3. Finally, based on this information, please write a short (no more than one page) recommendation stating which policy you would recommend and why.

I've included the table below as a guide to what you need to find. While you do not need to present your information in exactly this way, some table summarizing your results will be necessary.

	Command & Control	Emissions Fee	Tradable Permits
Amount abated by:			
Source A			
Source B			
Source C			
Emissions fee per ton	N/A		N/A
Expected permit price	N/A	N/A	
Marginal abatement cost of the last ton abated by:			
Source A			
Source B			
Source C			
Total abatement costs for:			
Source A			
Source B			
Source C			
TOTAL BENEFIT OF AVOIDED POLLUTION			
- TOTAL ABATEMENT COSTS FOR ALL 3 SOURCES			
= NET BENEFIT			

Part B

Now, consider a second scenario. The marginal abatement costs for the three firms remain the same. However, due to the prevailing winds, pollution from source C has a greater impact on city residents than pollution from sources A and B. Thus, the marginal damage varies across sources as follows:

- The marginal damage per ton of pollution emitted from sources A & B is \$15,000 per week.
- The marginal damage per ton of pollution emitted from source C is \$45,000 per week.

You have been asked to determine the following. As before, please use a table to summarize the numerical results. However, you may also write a short explanation for each question as appropriate.

1. Given this information, what is the efficient total level of pollution from *each* of the three sources? How does the total pollution abatement required compare to Part A?
2. Consider the policies originally proposed in Part A. For this part of the question, do not change the level of the policy chosen in part A. That is, this question asks how, if at all, the analysis would change using the *same* emissions fee or the same number of permits proposed in part A. How well do they achieve the desired level of pollution abatement from each firm in this new scenario? Compare the total costs of abatement and total benefits of avoided damage across all three firms for each policy.
3. Limiting your choice to the three policies proposed in part A, would you change your recommendation with the damages assumed in part B? Why or why not?
4. Finally, are there any adjustments that could be made to any of the original three policies that you would recommend instead of the original three? If so, please explain what you would suggest and why.