

Economics 2106H (Spring 2009) — Prof. Greg Trandel
 “As If” Homework Assignment # 4
 No answers need be submitted

- Institutions also respond to incentives. There’s been a recent controversy at Baylor University because of a policy that encouraged admitted incoming freshman students to retake the SAT exam. Any student who retook the exam was awarded a \$300 credit at the campus bookstore; any student who raised his or her score by at least 50 points received \$1,000 in merit scholarship aid. According to a story in the *The New York Times* (October 15, 2008), the university’s vice president for communications and marketing said that the reason for the policy “was driven primarily by the university’s desire to award additional merit aid. He said the new students had not had enough chances to qualify for the aid.” While that rationale may or may not be true, can you describe at least one other reason why Baylor might have thought it would gain from instituting this policy?
- This question concerns two pairs of roommates — Andi and Bobbi are one pair; Charley and Danny are the other. Each of these people has to decide whether to devote the time needed to “Clean” the apartment, or “Not” to clean. A person’s level of satisfaction depends on both the choice that person makes and on the choice made by his or her roommate.

Each of Andi and Bobbi agree that the four possible outcomes are ranked in this order.

Best	my roommate does all the cleaning jobs; I do none
2nd best	my roommate and I both share the cleaning jobs
2nd worst	I do all the cleaning; my roommate does none
Worst	neither my roommate nor I do any cleaning

Each of Charley and Danny, in contrast, agree that the outcomes are ranked in this order.

Best	my roommate does all the cleaning jobs; I do none
2nd best	my roommate and I both share the cleaning jobs
2nd worst	neither my roommate nor I do any cleaning
Worst	I do all the cleaning; my roommate does none

- (a) Using a “4” to represent the best outcome, and a “1” to represent the worst, put numbers in the following game boxes to make them consistent with the rankings described above.

		Bobbi				Danny	
		Clean	Not			Clean	Not
Andi	Clean			Charley	Clean		
	Not				Not		

- (b) Is the “game” between Andi and Bobbi best described as a “prisoners’ dilemma” or as a “chicken game”? How about the game between Charley and Danny?
- This question asks about the incentives felt by members of a legislative body. Although such a situation is really a multi-player game, this question asks you to analyze it as though it were a two-player game.

Suppose that a major (and very expensive) piece of legislation has come before the legislature. Legislators A and B have to (independently) choose to vote “for” or “against” the proposal. Assume that each of the two legislators believes it would be a good thing if the proposal is approved. However, the proposal is — at least for now — unpopular with many citizens. Other

things equal, each legislator would thus prefer to vote against the proposal. Each legislator thus has the same two objectives — have it pass, vote against it — but different legislators may weight the objectives differently.

Since we're only considering a two-player game, assume — given what else is going on in the legislature — that the proposal will pass if either (or, of course, if both) of the two legislators vote in favor.

- (a) Suppose that both legislators individually rank the four outcomes in the following order (from best to worst). Proposal passes but I vote against it. Proposal passes and both of us vote for it (so voters won't be mad only at me). Proposal fails (and I vote against it). Proposal passes because I alone vote for it.

In the first game table below, fill in payoffs (where "4" represents a legislator's most preferred outcome, a "3" his or her second-best outcome, a "2" is second-worst, and a "1" is worst) consistent with the above description.

With these preferences, assuming that each legislator knows both his or her own ranking and the ranking of the other person, and considering a two-player, two-choice game, what is the equilibrium(bria) of the game between the legislators? What name, if any, is given to a game with this payoff pattern?

- (b) Suppose instead that both legislators individually rank the four outcomes in the following order (again from best to worst). Proposal passes but I vote against it. Proposal passes and both of us vote for it (so voters won't be mad only at me). Proposal passes because I alone vote for it. Proposal fails (and I vote against it).

Fill in the appropriate payoffs in the second game table. With these preferences (again assuming full information), what is the equilibrium(bria) of the game between the legislators? What name, if any, do we assign to such a game?*

- (c) Suppose that Legislator A's preferences are those given in part (a), while Legislator B's preferences are those given in part (b). As above, assume that each legislator knows the preferences of the other person as well as his or her own preferences. Fill in the payoffs in the third game table. What is the equilibrium of this game?

- (d) In part (c), which legislator gets an outcome that he or she views as more favorable? Is there any possible way in which the legislator who gets the less favorable outcome might gain from pretending to be the other type of legislator?

		B			
		For	Against		
A	For			A	
	Ag't				

		B			
		For	Against		
A	For			A	
	Ag't				

		B			
		For	Against		
A	For			A	
	Ag't				

*Note: The two kinds of legislators described in the question are not the only kind who could exist. There could also be legislators who want to vote against the proposal and who truly want it to fail. Alternatively, there may also be legislators who want the package to be approved and who actually want to vote in favor of it. Neither of these types of legislators is very interesting to analyze with strategic techniques.

4. The accompanying table contains data on three things. The second column of the table shows the marginal value that consumers receive from various units of good Y that might be produced. The third column shows the marginal private cost of producing those units. The fourth column shows the marginal external cost that results from a negative externality that is associated with the production/consumption of the good.

Unit	MV	MPC	MEC	MSC
100	\$140	\$97	\$10	
200	135	98	12	
300	130	99	14	
400	125	100	16	
500	120	101	18	
600	115	102	20	
700	110	103	22	
800	105	104	24	
900	100	105	26	

- (a) Complete the table by filling in the marginal social cost of producing each unit of Y.
- (b) Assume that both firms and consumers ignore the MEC associated with producing Y, and that this market reaches a competitive outcome (i.e., goods are produced as long as the value of the good to consumers exceeds the cost to producers). To the nearest hundred, how many units of Y will be produced?
- (c) To the nearest hundred, how much Y should be produced into order to create the most (socially-)efficient possible outcome?
- (d) Is the the market equilibrium quantity less than or more than the efficient quantity of output? By (to the nearest hundred) how many units?
- (e) Why is it privately profitable to produce some units of this good even when the production of those units does not provide positive social benefits?

5. The accompanying table shows data on the marginal private value (or marginal benefit) that the buyers of a good receive from various units of good Z that might be produced, the marginal private cost of producing those units, and the marginal external value that results from a positive externality that is associated with the production/consumption of good Z.

Unit	MPV	MPC	MEV	MSV
100	\$100	\$78	\$36	
200	96	79	34	
300	92	80	32	
400	88	81	30	
500	84	82	28	
600	80	83	26	
700	76	84	24	
800	72	85	22	
900	68	86	20	
1000	64	87	18	

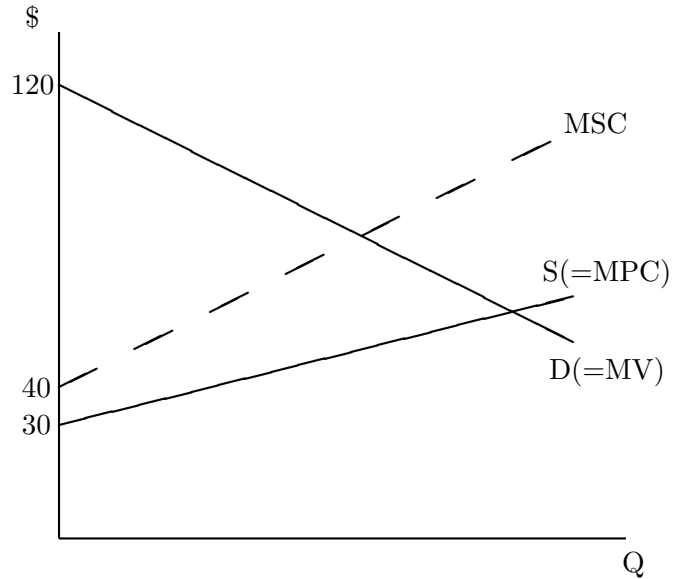
- (a) Complete the table by filling in the marginal social value of each unit of Z.
- (b) Assume that both firms and consumers ignore the external benefits associated with Z, and that this market reaches a competitive outcome (i.e., goods are produced as long as the value of the good to a buyer exceeds the cost to producers). To the nearest hundred, how many units of Z will be produced?
- (c) To the nearest hundred, how much Z should be produced into order to create the most (socially-)efficient possible outcome?
- (d) Is the the market equilibrium quantity less than or more than the efficient quantity of output? By (to the nearest hundred) how many units?
- (e) Why is it not privately profitable to produce some units of this good even when the production of those units would provide positive social benefits?
6. The growers of “standard” produce (fruits and vegetables) use pesticides and fertilizers to increase yield and decrease per-unit costs. Assume that some of those pesticides/fertilizers soak into the soil, are washed away by rainwater, accumulate in lakes, rivers, or oceans, and harm the organisms (perhaps including people) that rely on that water. [There is also the possibility that harmful amounts of pesticides might remain on produce when it is sold to consumers (and might, therefore, directly harm buyers). As far as this question is concerned, however, assume that whatever pesticide residue is left on the produce (if any) is not harmful (i.e., assume there

isn't any direct impact on the purchaser of the produce).] In contrast to these items, assume that "organic" produce is grown without the use of any artificial pesticides or fertilizers.

Quick observation at any grocery store indicates that consumers must pay a higher price to buy organic produce than to buy standard produce. This price differential presumably (at least in part) reflects the fact that it's more expensive for a grower to produce using organic methods than to produce using standard methods. The existence of this price differential, of course, discourages consumers from buying organic produce.

Explain why the difference between the grocery-store consumer prices of standard and organic produce does not accurately reflect the true difference in the costs of producing these products.

7. The accompanying figure shows the demand and supply curves for a particular good. Also shown is a marginal social cost curve that is sometimes relevant. The demand (marginal value) curve shown is written as $120 - .2Q$. The supply (marginal cost) curve is written as $30 + .1Q$. When there is a marginal external cost, the MEC curve is written as $10 + .1Q$. Use — assisted by the diagram — these formulae to answer the following questions.



- (a) For only this part of the question, assume that there is in fact no marginal external cost associated with the good (so that the marginal social cost curve shown in the picture doesn't really exist). In this case, how many units of the good are produced (in a competitive market outcome), and what economic surplus is created?
- (b) *For the rest of this question*, assume that the production of the good *does create* a marginal external cost. As independent, outside analysts, therefore, when you (correctly) evaluate the performance of this market, you should base all your calculations on the fact that there is a MEC associated with the good. I.e., you should base your answers on the fact that the marginal social cost curve is relevant. [You should do this even if the producers and consumers of the good ignore the MEC — the fact that they ignore something doesn't mean it's nonexistent.] Assuming that firms and consumers totally ignore the external costs of their actions, how many units of the good are produced?
- (c) In this market-equilibrium outcome, what economic surplus (measured correctly) is created?
- (d) Suppose that the only way to reduce the external cost is to reduce production of the good. In this case, how many units of the good should be produced in order to yield the largest possible economic surplus? How big is that economic surplus?
8. From an economic point of view, is there some positive amount of crime that could be considered to be the (socially) efficient amount of crime? If there is such a thing, briefly explain how one could (conceptually) determine the efficient amount of crime. [This is a condensed version of chapter 5, question 3.5 from Hubbard and O'Brien.]

9. Table I shows, for a variety of levels of industry-wide (daily) output, the marginal value, the marginal private cost, and marginal external cost created by the production/consumption of a good. This good is produced by a number of firms in a competitive market.

Quantity	MV	MPC	MEC
1000	63	27	4.5
2000	60	28	5
3000	57	29	5.5
4000	54	30	6
5000	51	31	6.5
6000	48	32	7
7000	45	33	7.5
8000	42	34	8
9000	39	35	8.5
10000	36	36	9
11000	33	37	9.5

Quantity	With-Tax Marginal Private Cost					
	tax = 0	tax = 2	tax = 4	tax = 6	tax = 8	tax = 10
1000	27	29	31	33	35	37
2000	28	30	32	34	36	38
3000	29	31	33	35	37	39
4000	30	32	34	36	38	40
5000	31	33	35	37	39	41
6000	32	34	36	38	40	42
7000	33	35	37	39	41	43
8000	34	36	38	40	42	44
9000	35	37	39	41	43	45
10000	36	38	40	42	44	46
11000	37	39	41	43	45	47

- (a) Based on the numbers in Table I, if consumers and producers ignore the external cost of their actions, what quantity of the good would be produced and sold?
- (b) Based again on Table I, what is the (socially) efficient quantity of production of the good?
- (c) Suppose that a tax is imposed on all the firms that produce this good. The tax is a fixed amount that any firm must pay for each unit of the good it produces. Such a tax raises the marginal private cost of producing the good (which in turn shifts up the supply curve of the good). Table II shows the with-tax marginal private cost of the industry's firms for various levels at which the tax could be set. What size tax will cause the with-tax private-market outcome (demand = supply) to match the (socially) efficient outcome?
- (d) Briefly explain how a tax set at the level you found in part (b) will *internalize the externality*.
10. Suppose that it has been decided that the total amount of pollution emitted by Polluter A and Polluter B must be decreased by a total of four tons. Originally, Polluter A and Polluter B each emit more than four tons of pollution. For purposes of simplicity, assume that — in the neighborhood of their current levels of emissions — it would cost \$10,000 per ton to reduce emissions from source A and would cost \$30,000 per ton to reduce emissions from source B.
- (a) Suppose there must be a two-ton reduction in the physical amount of pollution emitted by Polluter A and a two-ton reduction in the physical amount of pollution emitted by Polluter B. How much would it cost to reduce total emissions by four tons?
- (b) Assume that any polluter gets one “credit” by reducing its own pollution by one ton. A credit can be sold by A to B or can be sold by B to A. Suppose that each of Polluter A and Polluter B is responsible for possessing two (pollution-reduction) credits. Assume also that each polluter wants to meet its obligation at the lowest-possible cost, and that any mutually-beneficial transaction between the two polluters will occur. In this scenario, by how much would Polluter A likely reduce its emissions? By how much would Polluter B likely reduce its emissions? What would be the total cost (to both firms combined) of reducing total emissions by four tons?
11. Hubbard and O'Brien, 2nd ed., chapter 5, page 169, question 3.9.