

MBA 405B

Final Exam

Name: _____

SSN: _____

Section: _____

You have three hours to complete this seven-question exam. This is worth 50% of your final grade and contains a total of 150 points. Good luck.

1. (20) What is a network externality? Does McDonald's enjoy a network externality? Why or why not?

A network externality is a situation in which the more agents make the same decision, the more benefit they each receive. That is, the value of the network increases to each agent as more agents join. This means that each agent produces a positive spillover to the agents already on the network when he joins.

In the case of McDonald's, this would mean that the more people who bought their lunch at McDonald's, the more I would want to buy my lunch there. This seems highly implausible. In the abstract, it is conceivable that a restaurant could become trendy. It could be that knowing your friends are eating a particular establishment would make you more inclined to go there so that you could join the trend and thereby appear to be cool. This would be a network externality. It seems unlikely, however, that a fast-food restaurant would benefit from such a fashion. Indeed, the knowledge that McDonalds is popular seems more likely to cause you to decide to go to Burger King instead to avoid the crowds. This would be a negative externality due to congestion.

2. (20) Consider the following game in characteristic function form with three agents, $(1, 2, 3) \equiv \mathbf{I}$. The payoffs the various coalitions can get are the following:

$$\begin{aligned} F(1) &= F(2) = F(3) = 2 \\ F(1, 2) &= F(2, 3) = F(1, 3) = 3 \\ F(1, 2, 3) &= 6 \end{aligned}$$

- a. Write down a core allocation. Can you give more than one?

$$Y(1,2,3) = (2,2,2)$$

No. this is the unique core allocation. If any player gets less than 2, he will defect into his own single person coalition. This is a case in which the grand coalition does not produce any benefits on a per capita basis over single person coalitions.

- b. Write down an allocation that is not in the core. Write down the coalition and allocation that block it.

$Y(1,2,3) = (1.5, 1.5, 3)$ for example. Agent 1 can block this by defecting and consuming the 2 unit of surplus he produced by himself. There are many other noncore allocations, and many other ways to block both this and the other noncore allocations.

- c. What would happen to the size of the core if the payoff to the grand coalition went up to 8?

Now the game is super additive. The per capita payoff to the grand coalition is $2 \frac{2}{3}$ as compared to 2 for single person jurisdictions, and $1 \frac{1}{2}$ for two person coalitions. Thus, the core becomes large. In fact there are an infinite number of core allocations. For example $(4-x, 2, 2+x)$ for x in the interval $[0, 2]$, are all core allocations.

3. (20) What is an externality? What does it mean to internalize an externality?

An externality exists when the actions of one agent affect the welfare another agent outside of the price system.

An externality is internalized when something happens that causes an agent to fully incorporate the costs or benefits his actions have on others in his own decision-making. That is, when the costs or benefits of an agents actions which were felt by others instead are fully experienced by the decision maker. An example of a device that causes an externality to be internalized is a tax on pollution that is equal to the social damage that pollution causes.

4. (20) Consider the game below:

- a. Identify the pure strategy Nash equilibria, if any.
- b. Identify the Dominant Strategy equilibria, if any.
- c. Identify the Dominated Strategies, if any.

		Player 2		
		Left	Middle	Right
Player 1	Strategy A	1	20	10
	Strategy B	0	-2	9
	Strategy C	0	4	8
	Strategy D	0	19	12

Upper right corner for Player 2 and lower left for player 1.

A) There is no pure strategy Nash equilibria. Once you remove the three dominated strategies, you can see that you are left with a variation on the Holmes-Moriarty game in which you chase each other around the four remaining outcome boxes. There will be a mixed strategy equilibrium, however.

B) There are no dominant strategies, and so there can be no dominant strategy equilibrium.

C) For Player 1: Strategy B and C are dominated by both A and D.
 For player 2: Middle dominated by Left.

5. (25) Suppose that you have a new boss and you only have one chance to make a good first impression. You don't know if he is going to be one of those conservative (C) bosses who likes his employees to be very professional and well dressed, or an Innovative (I) boss who likes employees to think outside the box and be creative. You have to choose whether to wear your Brooks Brothers suit (BB) or your Blue Jeans (BJ) to work on his first day. If your boss is innovative and you wear a suit, you can expect no raise, but if you wear jeans, you can expect a raise of \$10,000. If he is conservative and you wear a suit, you can expect a raise of \$20,000, but only \$5,000 if you wear jeans.
- a. Suppose you think that there is a 60% probability that your boss is conservative. What should you wear?

$$EP(BJ) = 0.4 \times 10,000 + 0.6 \times 5,000 = 7,000$$

$$EP(BB) = 0.4 \times 0 + 0.6 \times 20,000 = 12,000$$

Rational answer is to wear suit. This is the highest expected payoff

- b. Suppose you discover that he is from MIT and this causes you to revise your guess that he is conservative downwards to 40%. Are you better off wearing a suit or jeans now?

$$EP(BJ) = 0.6 \times 10,000 + 0.4 \times 5,000 = 8,000$$

$$EP(BB) = 0.6 \times 0 + 0.4 \times 20,000 = 8,000$$

Now you are at the break-even point in terms of expected raise. Either choice is equally good.

6. (20) Barges in ancient China used to be pulled through canals by human power. The Bargemen received a bonus if they managed to get their cargo to its destination quickly. The problem was that each bargeman was tempted to shirk (by pulling the tow ropes very hard). One man shirking did not result much difference in how long the journey took, but would make life much easier for the shirker. Of course, if everybody else were shirking, one man pulling hard would not make much difference in speeding the journey either. What is likely to happen in equilibrium? What is the name for this type of situation? Suppose that laziest bargeman makes the following suggestion: Give me my full share of the bonus, and instead of pulling the barge I will follow the barge with a whip and will lash anyone I catch shirking. Should the bargemen accept this offer? Why or why not?

In equilibrium, everyone will shirk and there will be no bonus. For any given bargeman, the benefits of shirking outweigh the costs regardless of the actions of the other bargemen. Thus, shirking is a dominant strategy. As you can see, this is just a prisoner's dilemma with many agents. The dominant strategy equilibrium involves low payoffs and no cooperation. Cooperation (not shirking) would give all agents a better payoff,

The offer makes sense and should be accepted. In the current situation, everybody shirks, and no one gets any bonus. With the whipman, it now becomes in every barge-puller's interest to work hard. Shirking results in a punishment worse than hard work. Thus, all the bargemen work hard, they all get a bonus, and they are all better off.

7. (25) You are running an Internet company called "theice.com" which specializes in delivering ice cream cones that ordered over the web to office workers in Chicago. You have a competitor in the business called "thecream.com". Your competitor has received funding from venture capitalists, but you don't know how long the money will last. You think that there is a 20% chance that your competitor will have to declare bankruptcy in any given month. If you are both in business you each lose \$10,000 per month. If you end up outlasting the other firm, you expect a net payoff of \$60,000 in total. If you go out of business, your payoff is zero. Assume an interest rate of zero and that the other firm will stay in business as long as it can.

- a. Suppose a venture capitalist is willing to fund you for as long as it takes to win if he believes that the expected value of keeping you in business is positive. Can you persuade him to fund you based on the information above? (Hint: You will have to think about the relationship of the probability of bankruptcy by your competitor to figure out how much you discount future gains and losses. It may help to recall that the present value of a constant payment of B each period with an interest rate of r is B/r .)

The key to this problem is to realize that there is only an 80% chance that the losses arrive each period since there is a 20% chance that the competitive firm will go out of business. This means that the expected loss in the first period is $(.8)(-10,000)$. There is an 20% chance the firm will go out of business in the first period, and if the firm stays in business, an additional 20% chance it will declare bankruptcy in the second period. Thus, there is only a (0.8×0.8) probability that you will suffer a \$10,000 loss in the second period. In short, this is just as if you are discounting the future at a rate of 20%. More formally, the expected loss is:

$$\begin{aligned}
 & (.8) -10,000 + (.8)^2 -10,000 + (.8)^3 -10,000 + \dots = \\
 & \qquad \qquad \qquad 10,000/0.2= \\
 & \qquad \qquad \qquad 50,000
 \end{aligned}$$

Since the expected loss of waiting out your competitor is 50,000 and the expected gain is 60,000, this is a sound investment, and your venture capitalist should agree to fund you.

- b. Now suppose that you have a spy in thecream.com and he reports that there is a 40% chance that your competitor has only 40,000 in the bank, and a 60% chance that he has 80,000. Can you convince your venture capitalist to fund you based on this information?

Based on this information, there is a 40% chance he will last 4 months before bankruptcy and 60% chance he will last 8 months. If he lasts 4 months, you make $60,000-40,000= 20,000$ in profits, if he lasts 8 months you lose $60,000-80,000= -20,000$. The expected profit from funding the company is therefore:

$$0.4 \times 20,000 + 0.6 \times -20,000 = -4,000.$$

With this extra information, we have learned that the expected outcome for our business is negative 4,000 and venture capitalist firm should not invest in our business.