

Economics I, Winter/Spring 2018
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Non Cooperative Oligopoly

1. Consider the US and Iran decision whether to respect the existing nuclear agreement. Suppose the outcomes associated with respecting it or not are viewed according to the following payoff matrix:

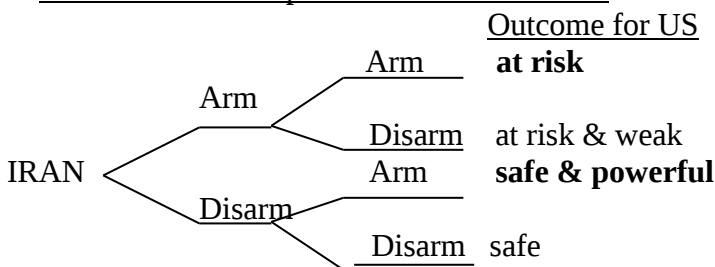
		United States	
		Respect	Deny
Iran	Respect	US safe, Iran safe	Iran at risk & weak, US safe and powerful
	Deny	Iran safe & powerful, US at risk & weak	At risk, at risk

a. Construct the extensive representation of the game and determine what strategy each of the superpowers will adopt.

b. Explain in words why this “game” is a form of the Prisoner’s Dilemma.

Solutions

a. Extensive Form Representation of the Game:



The dominant strategy for the US will be to arm because: if IRAN arms, then it is better for the US to also arm and be “at risk” than “at risk & weak” and if IRAN disarms it is still better for the US to arm and be “safe and powerful” than just “safe”. The same is true for Iran since this is a symmetric game. Therefore, both nations will arm and the result is that they will both be **at risk**.

This game is a sort of prisoner’s dilemma because the outcome resulting from it is not the best neither for society nor for the two players which will be better off by choosing both to disarm. Notwithstanding, they do not so in

2. HB and Lowenbrau are two major producers of beer in the Bavaria region in Germany. Both firms must decide whether to build a new brewery in the town of Würzburg. Since Würzburg is a big college town, both firms know that the demand for beer in the market is likely to be very high and both want to capitalize on the profits, but they also know that their profitability depends on whether or not their competitor decides to build a brewery as well. The potential profits of each company are represented in the following matrix:

		Lowenbrau	
		Build	Not Build
HB	Build	10,18	9, 26
	Not Build	12,21	11,24

(Payoffs are in millions of dollars, Lowenbrau's profits are listed first)

In this market, HB is much bigger and more efficient than Lowenbrau and thus gets more profit no matter which capacity scenario occurs. HB and Lowenbrau know each other's payoff in the matrix.

a. (4 pts.) Given the above payoff matrix, does HB have a dominant strategy?

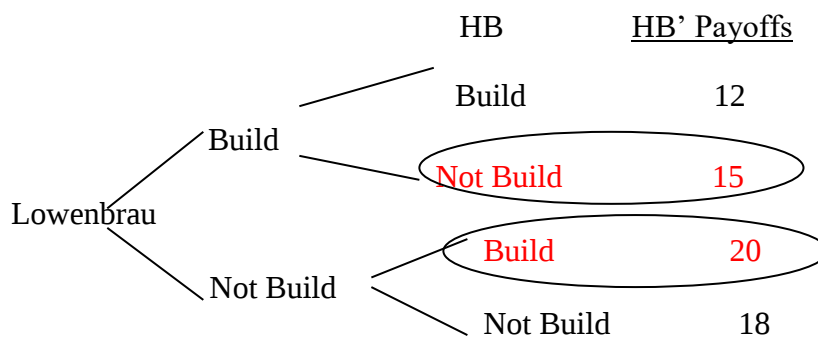
b. (4 pts.) Does Lowenbrau have a dominant strategy?

c. (4 pts.) Does this game have a Nash equilibrium?

Derive your answer by showing the extensive representation of the game.

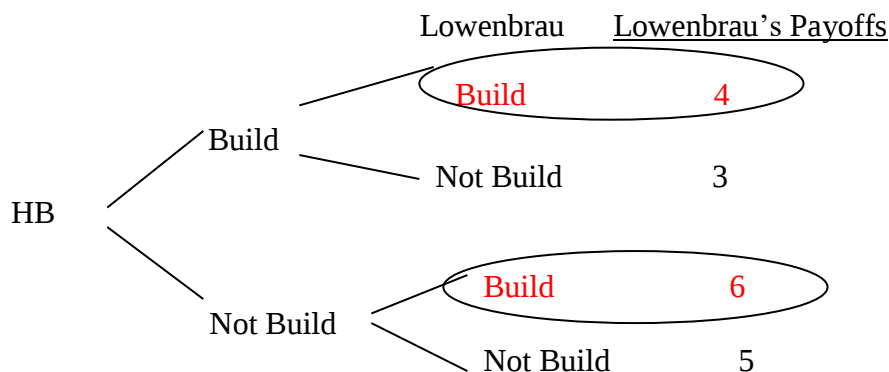
Answer:

a. We first start with the extensive representation of the game from Coor's perspective (shown below). We see that if Lowenbrau builds, then HB should not build (since not building yields profits of 15 versus 12 for building). If Lowenbrau does not build, then HB should build (since building yields profits of 20 versus 18 for not building.)



Thus, **HB does not have a dominant strategy.**

b. Now, let's look at the game from Lowenbrau's perspective. As shown in the extensive representation of the game shown below, **Lowenbrau does have a dominant strategy: build** because, no matter what HB does, building will yield greater profits for Lowenbrau(4>3 and 6>5).



c. Despite the absence of a dominant strategy for HB, there is still a **Nash equilibrium: NB builds and HB doesn't build.** This is because build is a dominant strategy for Lowenbrau. Thus,

Lowenbrau will choose not to build no matter what HB does. HB knows this (since it knows the payoff matrix). Thus, going back to the game from HB's perspective above, HB's best response is to not build and receive a profit of \$15 million rather than \$12 million.

3 Wall mart and K-mart are the two main discount department retailers in the Australian market. Both firms must decide whether to expand their business in New Zealand. Since the New Zealand market is characterized by small firms both companies know that they can easily conquer it and make high profits, even if the amount of them is conditional to the decision of the other. The potential profits of each company are represented in the following matrix:

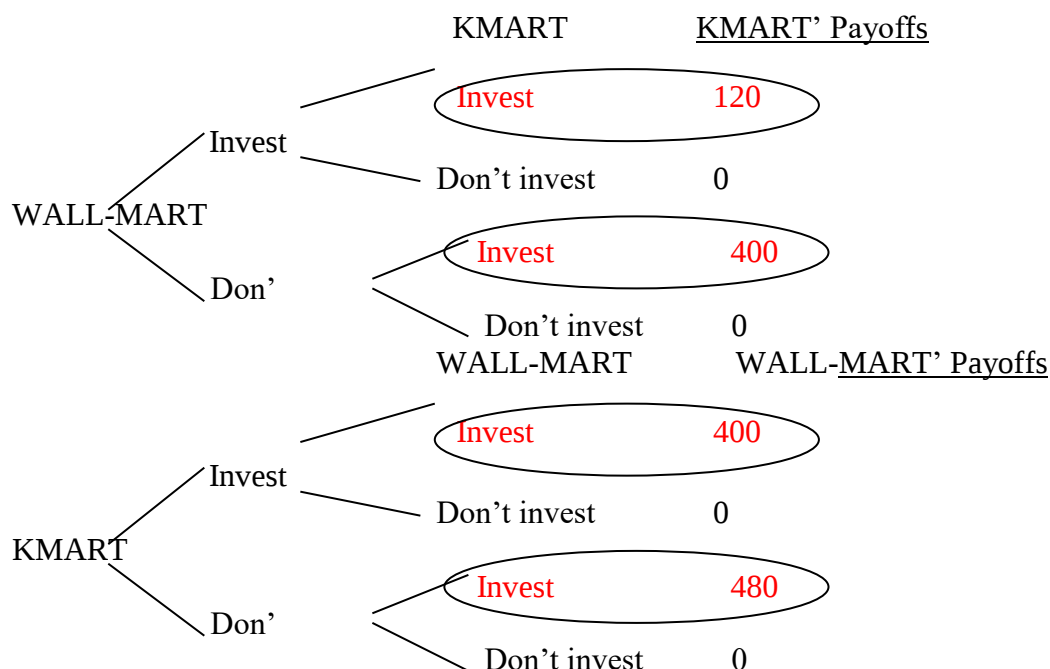
		K-Mart	
		Invest	Not Invest
Walmart	Invest	120,400	0,480
	Not Invest	400,0	0,0

(Payoffs are in millions of dollars, Walmart's profits are listed first)

Walmart appears much bigger than K-Mart and thus can apply bigger economies of scale that make it earn more profit no matter which capacity scenario occurs. The two corporations know each other's payoff in the matrix.

- Given the above payoff matrix, does Walmart have a dominant strategy?
- Does K-Mart have a dominant strategy?
- Does this game have a Nash equilibrium?

Derive your answer by showing the extensive representation of the game.



Both firms have the same dominant strategy that is to invest. Hence, the Nash Equilibrium of the game will result in both firms deciding to invest in the new business in New Zealand.

4 Gatorade and Energade are the two main producers of sport-drinks in the U.S. They are both considering the introduction of a new drink in the market. The pay-off associated with this decision for the two firms are the following:

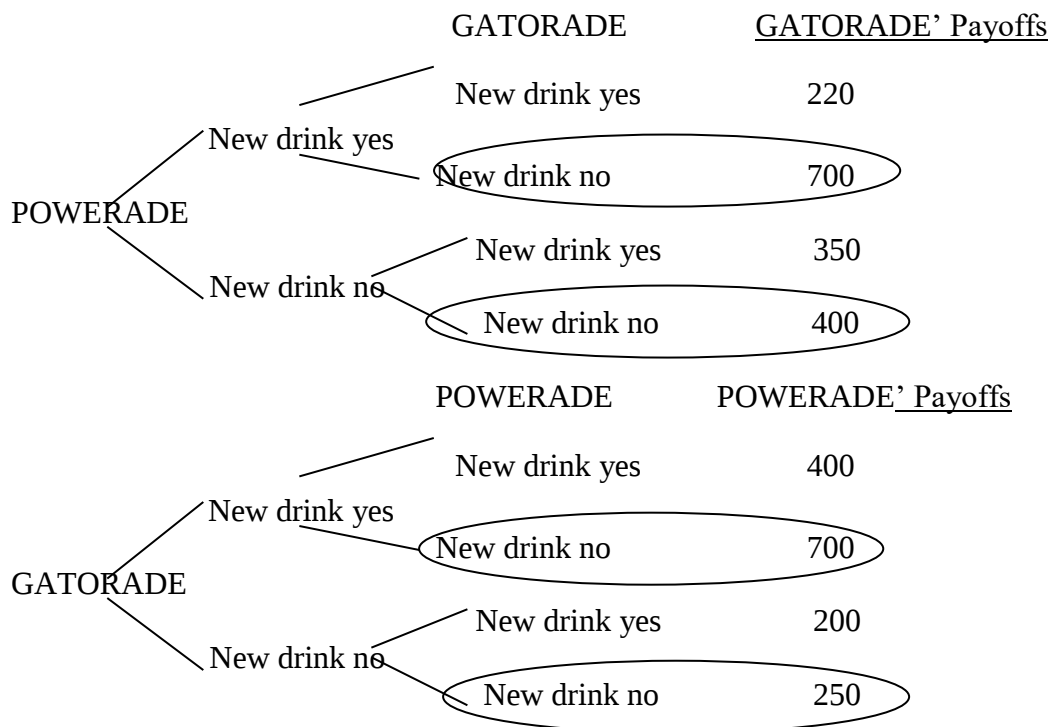
		Gatorade	
Powerade		New Drink yes	New Drink no
	New drink yes	220,400	700,200
	New drink no	350,700	400,250

(Payoffs are in millions of dollars, Powerade's profits are listed first)

Show the extensive representation of the game faced assuming that firms are operating in a Cournot-type duopoly, i.e. both have the same information and choose their strategy at the same time.

- Given the above payoff matrix, does Gatorade have a dominant strategy?
- Does Powerade have a dominant strategy?
- Does this game have a Nash equilibrium?
- Show the extensive representation of the game faced by Gatorade assuming that it is operating in a Stackelberg-type duopoly, i.e. Gatorade chooses its strategy first (leader). What strategy will Gatorade choose and will the outcome be different from the one above
Derive your answer by showing the extensive representation of the game.

Answer



Both firms have a dominant strategy that is to invest. With stackelberg competition the outcome is not going to change.