Lecture 13(ii) Announcements

1. Application of Game Theory: Duopoly (The “one-shot” game case)

2. Duopoly with repeated game

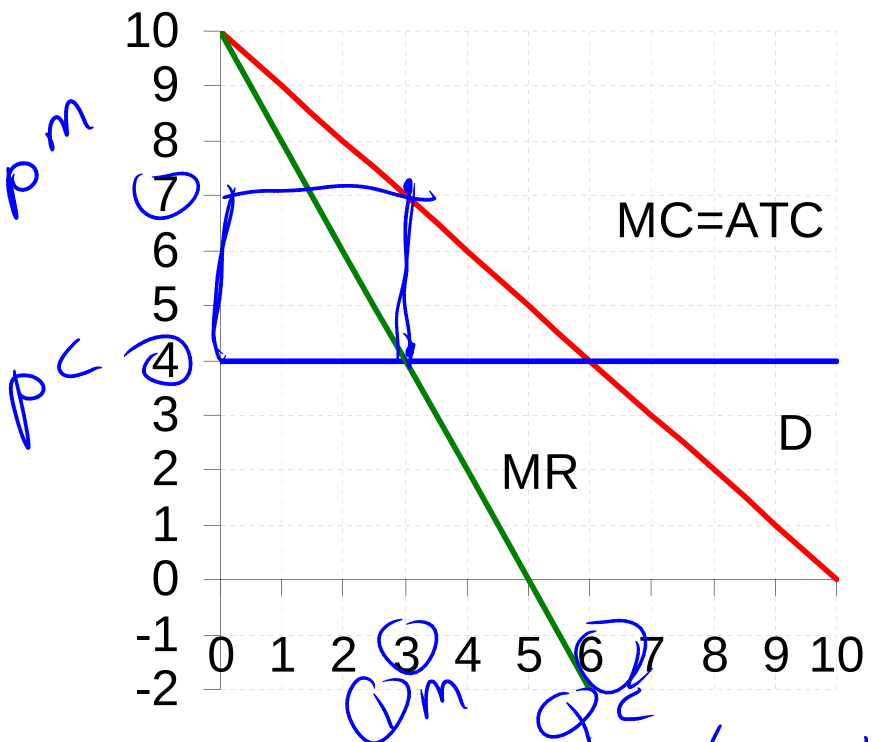
3. Competition Policy in the U.S. and Europe

4. Monopsony

5. Application of Game Theory: The Cold War and Mutually-Assured Destruction.

Duopoly In Econland

Goldy and Bucky have entered Widgit business



With perfect comp, get Q = 6 P= 4

With monopoly, get Q = 3, P = 7

What happens with duopoly?

It depends. Let's look at some cases.

1. Have to post prices, stay that way for the entire day.
2. Have to be a round number.
3. Buyers buy from the lowest price firm. If prices the same, then the sellers split the market.
4. For now, look at prices 6 and 5.

Let's suppose we have the scenario above. Let's work out what happens.

We will need to map this into the prisoner's dilemma payoff matrix from the previous lecture.

Payoff Matrix
How Profit Depends Upon Both Actions

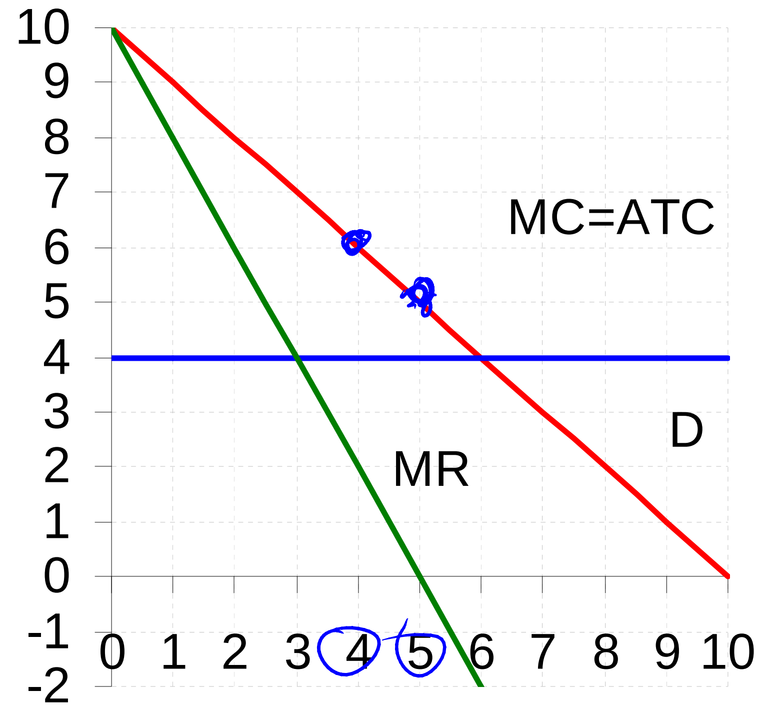
Goldy

Bucky	**Goldy: P = 6**	**Goldy: P = 5**
P = 6	G gets 4 / B gets 4	G gets 5 / B gets 0
P = 5	G gets 0 / B gets 5	G gets 2.5 / B gets 2.5

Nash eq: both pick P=5.

Setting low price a "dominant strategy."

If other guy sets P=6, then by setting P=5 get 5 instead of 4. If other guy sets P=5, then by setting P=5 get 2.5 instead of 0.



Suppose both set P = 6. Then total quantity is Q = 4, and the split it 50/50, so q = 2 for each.

$(6-4)\times 2 = 4$

Profit for each is_____

So put this in Payoff Matrix when both set P = 6.

Suppose both set P = 5.
Then total quantity is Q = 5, and they split the market 50/50, so q = 2.5 for each.

Profit for each is $(5-4) \times 2.5 = 2.5$ ______
So put this in the Payoff Matrix for the profit each gets when both set P = 5.

If one sets P=5 and the other P=6.

Consumers buy 5 units when price is 5. All the sales go the low-price firm.
Profit to low price firm = (5-4)*5 = $5
Profit to high price firm=(6-4)*0 =$0

But these in the payoff matrix.

Looking at this payoff matrix, we see:
The unique Nash equilibrium is for both to set P=5, regardless of what the other does.

Dominant Strategy?

Yes, it is better to choose P=5 over P=6, regardless of what the other firm does

If could cooperate?

If they could cooperate and set P=6 instead of P=5, then each would get 4 in profit. Instead, in the equilibrium outcome where each sets P=5, they get only 2.5 each.

Other prices?

1. P = 7 is monopoly price.
   But....

2. P = 4?

What if both guys set price equal to 5. Does one firm have an incentive to undercut at P = 4?

No incentive to do that, because profit = 0 at P = 4, and if I match your price = 5, I get at least 2.5.

So Nash Equilibrium is....

both pick P = 5. This is a Nash equilibrium of game where firms can pick 4,5,6,7,etc simultaneous move.

What about if repeated every day forever?

Can sustain cooperation with threat to revert to price war.

Monopoly price: P = 7.
Market Q = 3
Each sells q=1.5,
profit for each is (7-4)*1.5 = 4.5

Threat: if every the other guy sets P<7, then just set P=4 after that.

Look at incentives:
Take as given other guy setting P=7
If match, then get 4.5 today.

If set p = 6, get whole market of Q=4.
Make profit (6-4)*4 = 8.

Short term gain!
But then its over...

So compare::

	Cooperate Forever	Cheat today
today	4.50	$8.00
tomorrow	4.50	0.
next day	4.50	0.
day after that	4.50	0.
….	4.50	0.

If care about the future, cooperation is sustainable.

(But if desperate for cash now, might see breakdown of cooperation)

What if there more bidders?

Suppose 3 sellers:
Goldy, Bucky, and Hawkeye.
Cooperate a monopoly forever, each sets price at $7, divide Q=3 three ways, profit is (7-4)×1 = $3.

Returns to Cooperation and Cheating with 3 Firms (split monopoly 3 ways)

	Cooperate Forever	Cheat today
today	3	$8.00
tomorrow	3	0.
next day	3	0.
day after that	3	0.
….	3	0.

Compare with 2 firm case:
(split monopoly 2 ways)

	Cooperate Forever	Cheat today
today	4.50	$8.00
tomorrow	4.50	0.
next day	4.50	0.

Gain from cheating same as before.

But gain from cooperating is less.

So cheating on agreement is more likely.

Cartels more likely to work if:

(1) interaction is frequently repeated and participants care about the future.

(2) The fewer players, the better

(3) If other players can more quickly react. (If information about what each other is doing goes back and forth quickly.)

(4): Cooperation more likely with a more favorable legal environment.

Current law is not favorable for cartels

U.S. Antitrust Law:
1890 Sherman Act outlaws price fixing
If part of a conspiracy to fix price can go to jail.

Europe: Regulated by the European Commission.

Let's take a look at the web site of the European Commission concerned with competition policy.
http://ec.europa.eu/competition/index_en.html We can see some examples of cartel cases that have been prosecuted
http://ec.europa.eu/competition/cartels/overview/index_en.html

In the news: ATT Time-Warner merger

Monopsony
One buyer rather than one seller
Text: "This book does not present the formal model of monopsony since monopsonies are rare. In most labor markets, workers have many possible employers, and firms compete with each other to attract workers.

More recent research
(1) wage share of the value of output is decreasing
(2) increasing concentration in US on account of superstar firms (e.g. Walmart)
(3) some interesting recent evidence connecting the two

Democrats (including Senator Amy Klouchar) driving to change antitrust to include consolidation of labor markets.

Application of Game Theory: The Cold War and Mutually-Assured Destruction.

Potential Prisoner's Dilemma Situation for a first strike nuclear Attack.

Soviet Union

U.S.	**First Strike**	**Don't Attack**
First Strike	USSR gets –100 U.S. gets - 100	USSR. gets−1000 US. gets 200
Don't Attack	USSR gets 200 U.S. gets −1000	USSR gets 0 U.S. gets 0

The unique Nash equilibrium is Both choose "First Strike" (Prisoner's dilemma again.)

Suppose instead, each party can **credibly** commit to launch a massive retaliatory attack on warning. So if one party launches a first strike, nuclear winter results. The payoffs now look like: (where **−∞** means "minus infinity")

Soviet Union

U.S.	**First Strike**	**Don't Attack**
First Strike	USSR gets −∞ U.S. gets −∞	USSR gets −∞ US. gets −∞
Don't Attack	USSR gets −∞ U.S. gets −∞	USSR gets 0 U.S. gets 0

The unique Nash equilibrium is now

Both choose "Don't Attack"

This is the concept of mutually-assured destruction, (MAD) which results in a kind of stability.

- Requires both to keep up in an arms race (if one is more powerful than the other then MAD can break down).
- Requires rationality on both parts.

A useful theory for thinking about Soviet/U.S. Cold War interactions.

Not a useful theory for thinking about North Korea and Iran....

Lets use game theory to talk about Arms Control (See Ch 17 of Mankiw text, page 374.) Text presents the following model of an "Arms Race"

		Soviet Union	
		Arm	Disarm
U.S.	Arm	USSR at risk; U.S. at risk	USSR at risk, weak; US. safe, powerful
	Disarm	USSR safe, powerful; U.S. at risk, weak	USSR safe; U.S. safe

Again, we see the usual Prisoner's Dilemma, where unique equilibrium is both chose "Arm"

Again, if could cooperate, both would be better off if both disarm.

Try an arms control agreement. Both parties can be better off. **But it is crucial for both sides to be able to verify compliance of the other party.**