11.203

Oligopoly, Day 2

Kinked Demand Curve Theory

Game Theory

Adapted from Parkin (2003) 6th ed.

October 28, 2010

Revised 10/28/2010 at 1pm

Kinked Demand Curve Theory

Remember:

In oligopoly, the quantity sold by any one firm depends on that firm's price and the quantities and prices chosen by its competitors.

In the Kinked Demand Curve model:

Each firm believes that if it raises its price, none of its competitors will follow, but if it lowers its price all of its competitors will follow.

How will this affect the price the firm chooses?

Kinked Demand Curve Theory

The airline believes that the demand for its product has a kink at the current price and quantity (P*, Q*)

Above the kink, demand is relatively elastic because all other firms' ticket prices remain unchanged

Below the kink, demand is relatively inelastic because all other airlines will follow and lower their prices too

$/ticket

MC

P*

MR

D
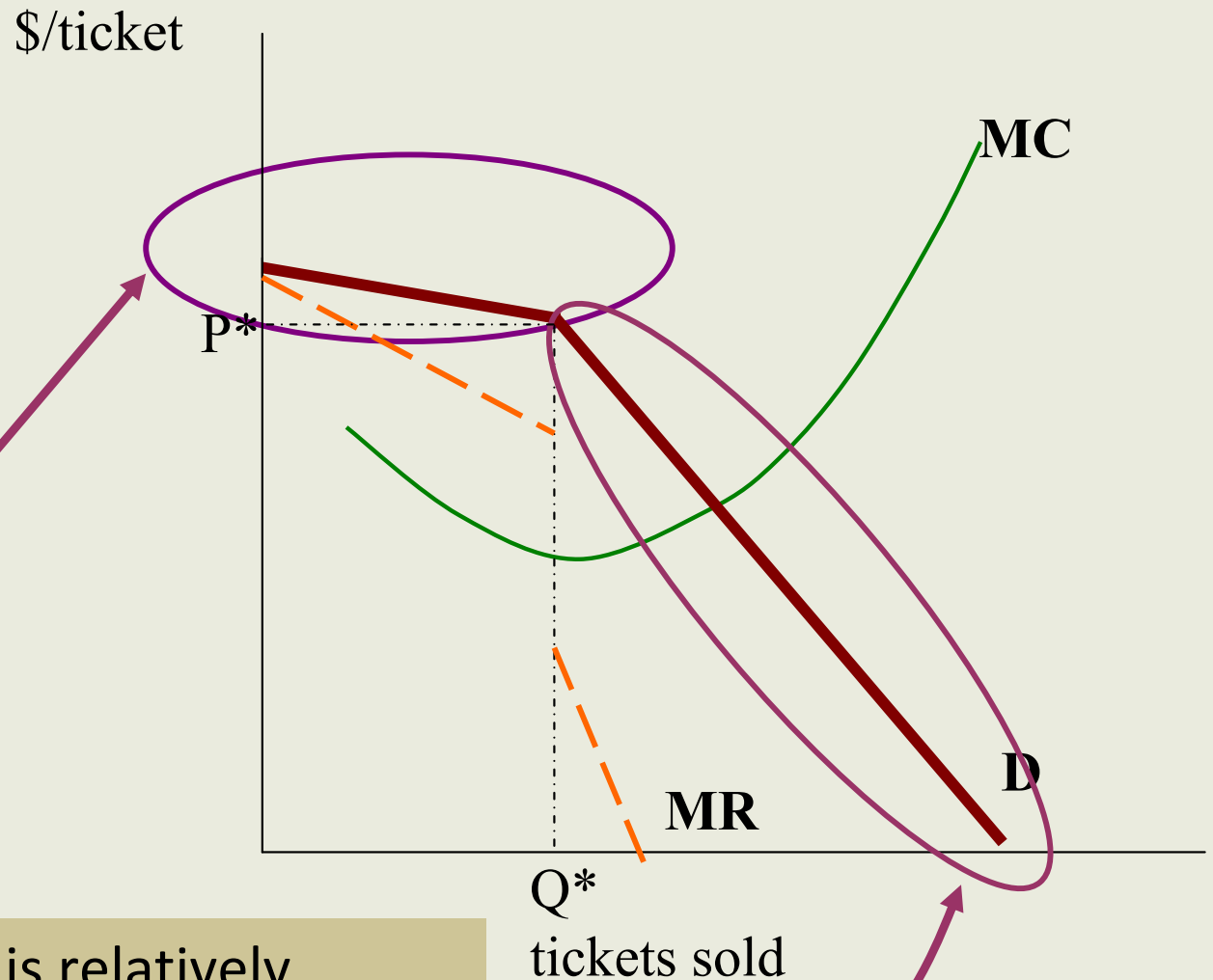
Q*
tickets sold

Kinked Demand Curve Theory

The kink in the demand curve means that the *MR* curve breaks off at the current quantity

Fluctuations in MC that remain within the discontinuous portion of MR leave the profit-maximizing quantity and price unchanged.

So quantity and price are stable, even with some changes in costs.

$/ticket

MC higher

MC

MC lower

P*

D

MR

Q*

tickets sold
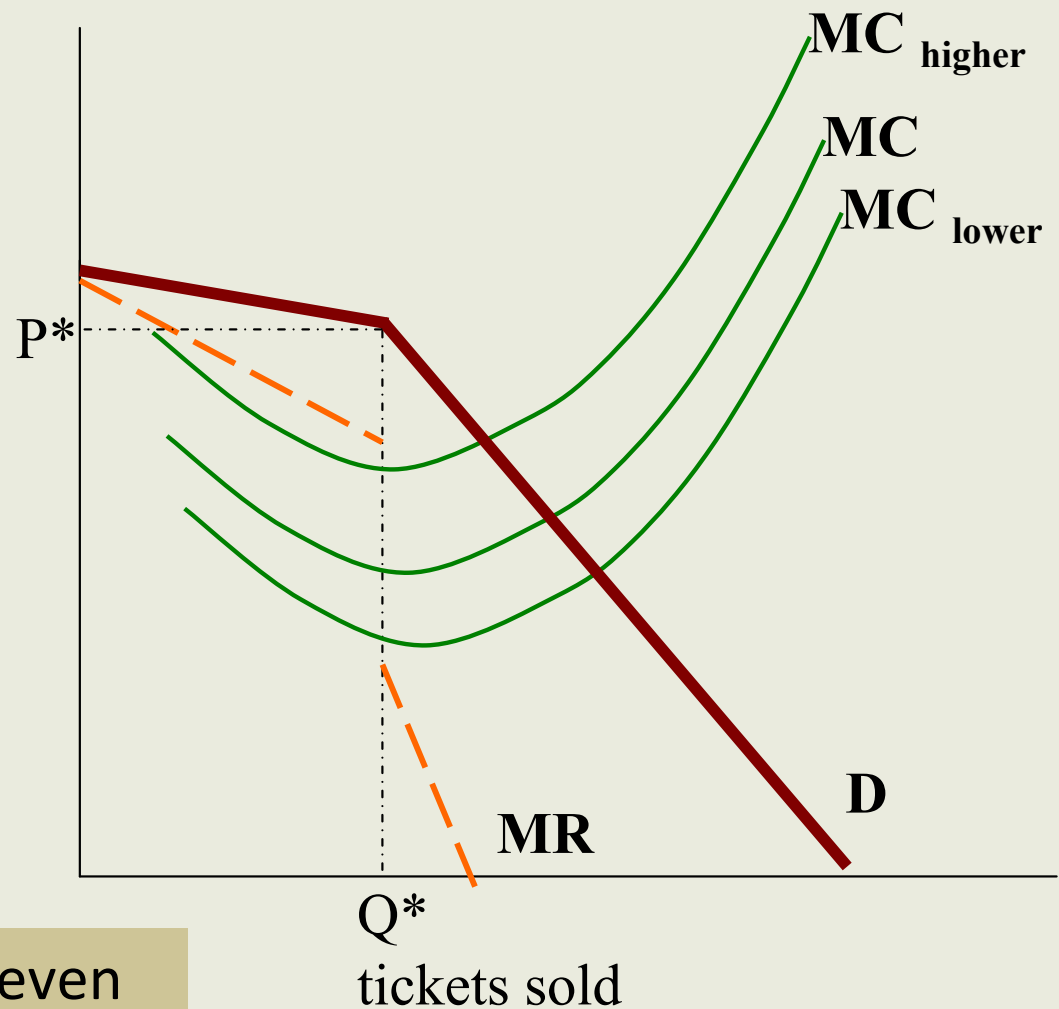
Price wars are futile, so airlines compete on other things, like schedules, free bags, etc.

Strategy and Cooperation

- We know firms can act as a monopolist if they cooperate and form a perfect cartel

- But if firms cheat, they won't reach the monopolist's price and quantity

- So why would any firm want to cheat?

Example: Boeing and Airbus

Review of Different Market Outcomes

A cartel would choose to produce 6 airplanes (total) and charge $13 million for each

Firms acting in perfect competition would choose to produce 12 airplanes (total) and charge $1 million each, making zero profit.

Firms in oligopoly that *do not* form a perfect cartel would produce between 6 and 12 airplanes.

What if they both cheat?

- If Airbus cheats too, both will make less profit than they would have made as a cartel.

- So what will the firms do? Cheat or cooperate?

- Game theory helps us predict their behavior.

Every game has:
1. Rules
2. Strategies
3. Payoffs

We'll discuss two classic games:
1. Prisoners' Dilemma
2. Chicken

The Prisoners' Dilemma

2 prisoners, Bernie and Martha, have been caught red-handed stealing a car.

Each is held in a separate cell and cannot communicate with the other.

The sentence for stealing a car is 2 years, and the D.A. has enough evidence to get a conviction.

The Prisoners' Dilemma

Police suspect the two of carrying out a recent bank heist

Sentence would be 10 years, but the D.A. doesn't have enough evidence to get a conviction

The D.A. offers each prisoner the same deal:

Confess, turn in accomplice, and you'll serve only 1 year

(But if they both confess, they get 5 years each)

The Prisoners' Choices

Bernie and Martha each have two possible actions:

1. Confess to the bank heist

2. Deny having committed the heist

With two players and two actions for each player, there are four possible outcomes:

1. Both confess
2. Both deny
3. Bernie confesses and Martha denies
4. Martha confesses and Bernie denies

The Payoff Matrix

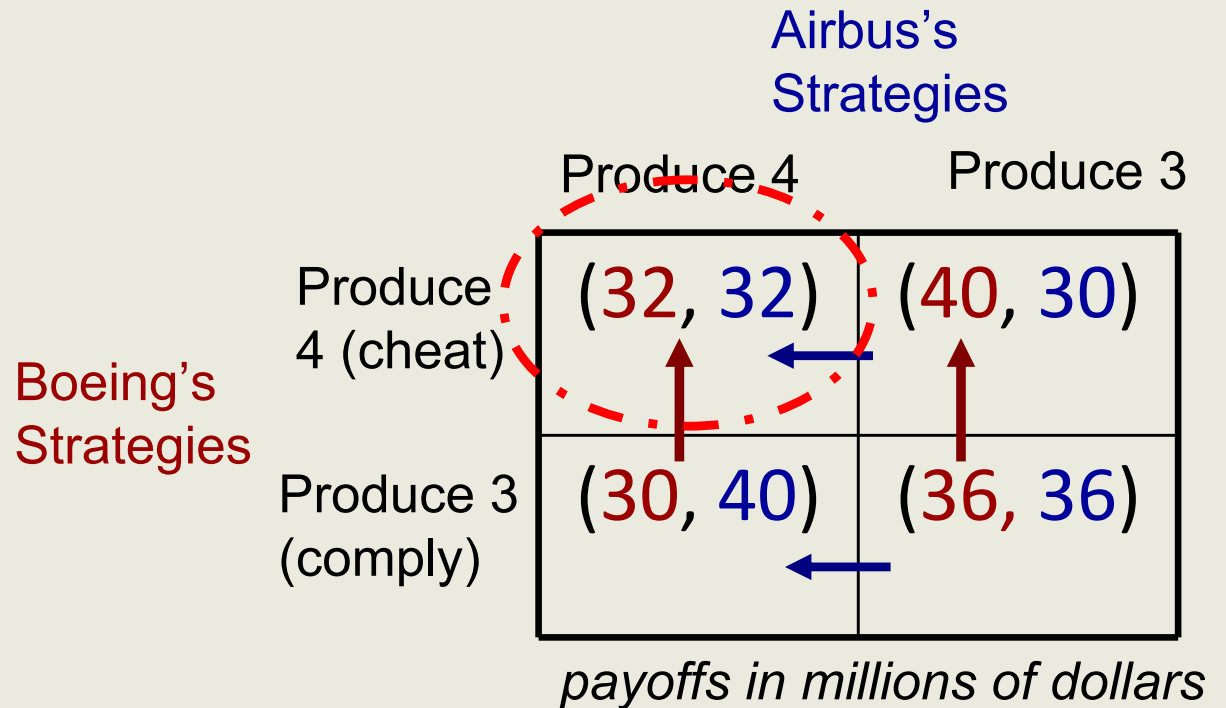For both prisoners, "Confess" is the dominant strategy.

Both prisoners confessing is the Nash Equilibrium.

But is this the best solution for the prisoners?

Martha's Strategies

Bernie's Strategies

	Confess	Deny
Confess	(-5, -5)	(-1, -10)
Deny	(-10, -1)	(-2, -2)
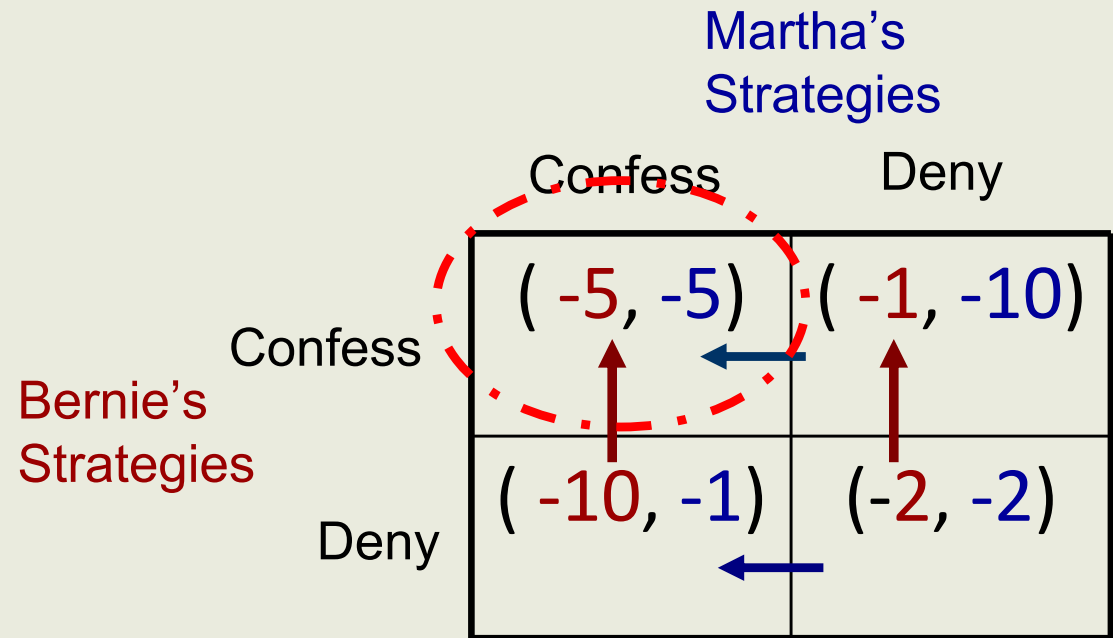
Duopolist's Dilemma

Recall the incentives for Airbus and Boeing to act as a cartel or to cheat in the cartel by producing an extra unit (4 per week, rather than 3)

Airbus's Strategies

	Produce 4	Produce 3
Produce 4 (cheat)	(32, 32)	(40, 30)
Produce 3 (comply)	(30, 40)	(36, 36)

Boeing's Strategies

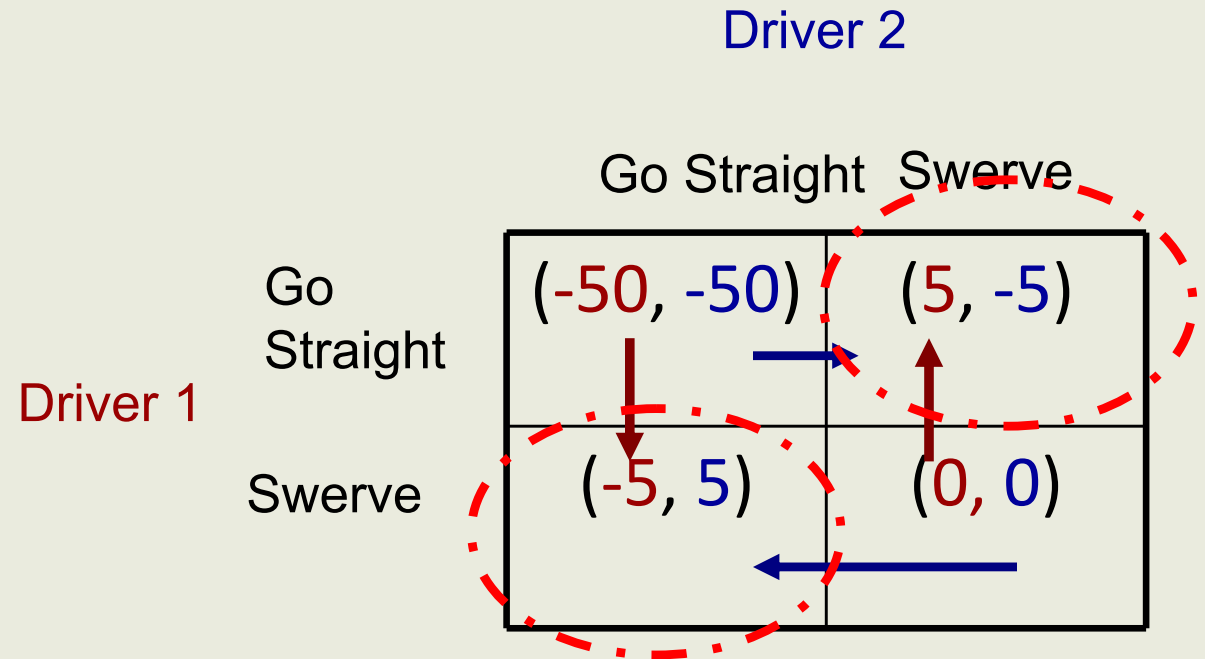*payoffs in millions of dollars*

Cheating (producing 4 per week) is the dominant strategy for both, and it is the only Nash equilibrium.

Is this outcome consistent with Adam Smith's "invisible hand" in the marketplace?

Chicken Game

Not all games follow the prisoners' dilemma model

Driver 2

Go Straight Swerve

Driver 1

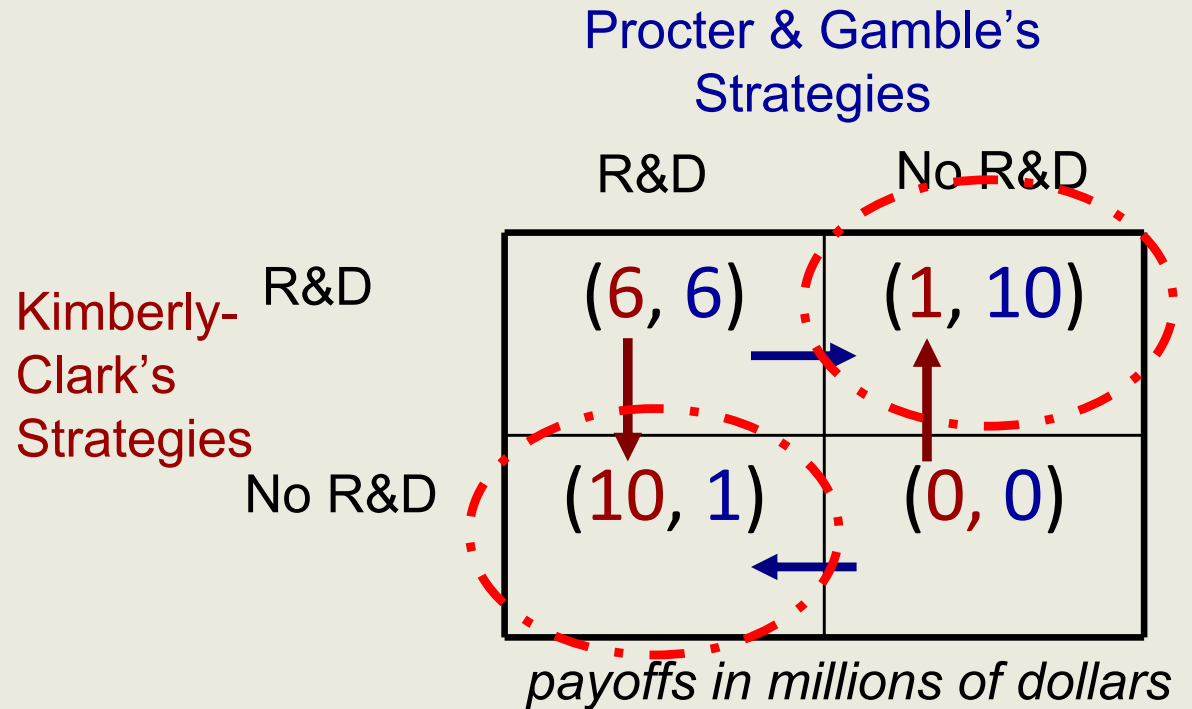|	Go Straight	Swerve
Go Straight	(-50, -50)	(5, -5)
Swerve	(-5, 5)	(0, 0)

<u>**CORRECTED**</u>

Chicken Game: R&D

Consider two manufacturers of baby diapers

Assume firms can boost profits by investing in R&D to improve products. But innovations aren't patented.

There is no dominant strategy.

There are two Nash equilibria

Procter & Gamble's Strategies

	R&D	No R&D
R&D	(6, 6)	(1, 10)
No R&D	(10, 1)	(0, 0)

Kimberly-Clark's Strategies

payoffs in millions of dollars

Repeated Games

- Repeated Games
  - Most real-world games are played repeatedly
  - Repeated games have a larger number of strategies because a player can be punished for not cooperating.
  - So real-world duopolists might find a way to cooperate so they can enjoy monopoly profit.

- How easy it is for firms to maintain a cartel depends on the number of firms in the cartel and the ability of firms to detect and punish cheating.

Airbus's Strategies

	Produce 4	Produce 3
Produce 4 (cheat)	(32, 32)	(40, 30)
Produce 3 (comply)	(30, 40)	(36, 36)

payoffs in millions of dollars

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