Chapter 9 & 15.1-15.2: Cournot competition

3.1 Game theory

A **game** is a stylized model that depicts situations of strategic behavior, where the payoff for one agent depends on its own actions as well as on the actions of other agents. The choice of one player depends on what it expects the other players to do.

A game consists of:

- *A set of players.* Who is involved?
- *A set of rules.* Who moves when? What do they know when they move? What can they do *(strategy space)*?
- *A set of payoff functions*. The utility each player gets as a result of each possible set of actions.

All this is common knowledge.

To get a solution of a game we use a prediction of how the game will be played between rational, utility-maximizing players. Both players make their choices simultaneously, meaning that they act without the knowledge of what the other player has done.

A player has a **dominant strategy** whenever he has a strategy that is strictly better than any other strategy regardless of what strategy the other players will choose. If a player has such a strategy and is rational we expect the player to choose the dominant strategy.

A player has a **dominated strategy** whenever he has a strategy that is never the good strategy because there are better ones available.

An example:

		Column	
		Cooperate	Defect
Row	Cooperate	3,3	0,4
	Defect	4,0	1,1

Both players are better of choosing Defect instead of Cooperate. So choosing Defect is a dominant strategy for both players. This leads to the circled outcome. Both players have to be rational and have to assume that the other player is also rational. The point where both players choose Defect is called a **Nash equilibrium**.

When we look at the graph it would be more profitable for both firms if they both would choose to

Cooperate. However that is not credible, unless the game is repeated. If you repeat the game over and over again the number of strategies increases because you then also can consider what has happened in the past.

3.2 Cournot competition

The most common model of an imperfectly competitive market is the **Cournot model** of quantity-setting oligopoly. In this model there are two firms active and each firm decides how much it will produce. Prices adjust so that the quantity suppliers supply equals the total quantity demanded.

In this model we assume that the firms know everything about the market, the product is standardized and the two firms have identical and constant average costs. The market inverse demand equals:

$p = a - bQ$

Each firm acts independently and wants to maximize its own profits, given that the other firm is producing the equilibrium output. Each firm does what's best for him given what the other firm does; this is called the **Nash equilibrium**:

First the **best response (reaction) function** of both firms has to be determined. This function consists of all the pairs of outputs that maximize one firm's profits for an arbitrary output level of the other firm. So when there are two firms active in the market, the reaction function of firm 2 depends on the quantity supplied by firm 1.

When firm 1 has decided how much it will produce, there will be a part of the demand that still has to be supplied. The amount that is left for firm 2 to supply is given by the **residual demand function**.

The value of the Cournot equilibrium can be found by solving the equations of the best response functions of firm 1 and firm 2. This gives the coordinates where the two functions intersect. The total output is the sum of the quantities produced by firm 1 and firm 2.
In a Cournot model the Lerner index for market power, with c_i marginal cost of firm *I*, s_i market share and ε elasticity of demand, is;

$$\frac{p - c_i}{p} = \frac{s_i}{\varepsilon_{Qp}}$$

The Herfindahl-Hirschman index (H) is the sum of squares of market shares of all firms in the industry. We use this index to calculate the **industry-average Lerner index**, with $\hat{c}$ market share weighted marginal cost:

$$\frac{p-\hat{c}}{p}=\frac{H}{\varepsilon_{Qp}}$$

3.3 Horizontal mergers

Mergers have an impact on market and firm structure. Mergers are created because people want corporate control. There are three kinds of mergers; horizontal mergers, vertical mergers and conglomerate mergers.

A **horizontal merger** is a merger that can create a market leader or concentrate the supply in the hands of only a few firms. It replaces two or more former competitors with a single firm. The merger of a duopolist creates a monopoly. Mergers raise antitrust concerns because they may create a legal cartel.

The **merger paradox** is that it is very difficult to construct an economic model in which there are high gains for firms participating in a horizontal merger that is not a merger to monopoly. So a merger will almost certainly be unprofitable in the Cournot model as long as the merger does not create a monopoly. The paradox also states that the true beneficiaries of a merger are the nonmerging firms.

A merger of two firms will reduce both fixed costs and variable costs. If these cost saves are large enough, the merger can be profitable.