Micro Zusammenfassung

What is Economics ?

↳ Science of human behaviour as a relationship between ends and scarce means which have alternative uses.

Trade

↳ Trade can be mutually benefitial.

ex. if two parties produce 2 goods and one is more efficent at one good then the other, they can both maximize their output by producing just one and then trade with each other.

Production Frontier

↳ Graph that shows how much of 1 product can be produced, when also producing a second product.

⇒ it shows the optimal production level

Economics Departements

- Microeconomics → Focus on individuals
- Macroeconomics → Focus on aggregate level (Gesamtebene)
- Econometrics → Statistical Methods
- (Finance) → Focus on financial markets

Microeconomics

- Supply and Demand, Elasticity
- Consumer Theory
- Producer Theory
- Market Structures
  - ↳ Perfect Competition
  - ↳ Monopoly
  - ↳ Oligopoly
- Game Theory

Profit Maximization

↳ we assume firms choose the quantity of a good to sell to maximize their profits.

Firms Profit can be calculated as:

$$\pi(q) = R(q) - C(q)$$

$q \to$ quantity produced
$R(q) \to$ firm's Revenue
$C(q) \to$ firm's Cost

From this we can now calculate the (marginal) Additional Revenue & Cost of selling / producing one more unit as

$R'(q)$ and $C'(q)$ (Ableitung)

To maximize profit, a firm wants to produce to the point where the marginal cost is equal to the marginal revenue

$$\Rightarrow \boxed{R'(q) = C'(q)}$$

Consumers

→ many consumers → consumer is price taker

→ consumer buys when prize is below the value that they attach to the product

Markets

Monopoly

↳ one firm serves the whole market

→ market power

Oligopoly

↳ Few firms serve the whole market

→ price setting power but have to respect competition

Perfect Competition

↳ Many firms serve the market

→ quite rare (ex. wheat market)

⇒ Market form decides price setting power

Perfect Competition

→ many small firms → firms are price takers

↳ no single firm has the power to influence the market price

→ goods are homogeneous

↳ all firms produce the exact same product

→ free market entry & exit

↳ firms can come and go without cost

Problem of the firm

⇒ maximize profits

traditionally profit is maximized if

$$R'(q) = C'(q)$$

but because the firm cannot influence the marked price

$$R'(q) = p$$

Therefore Profit is maximized with

$$p = C'(q)$$

(price = marginal cost)

Market Demand in pefect Competition

→ every consumer has a maximal willingness to pay for a product

↳ This valuation can be written as a cumulative distribution function (CDF) → $F(x) = P(v_i \leq x)$

v_i = willingniss to pay

Now the Demand at a certain price can be calculated as:

$$D(p) = 1 - F(p)$$

Market Supply in pefect Competition

We can calculate the market supply at a certain price as:

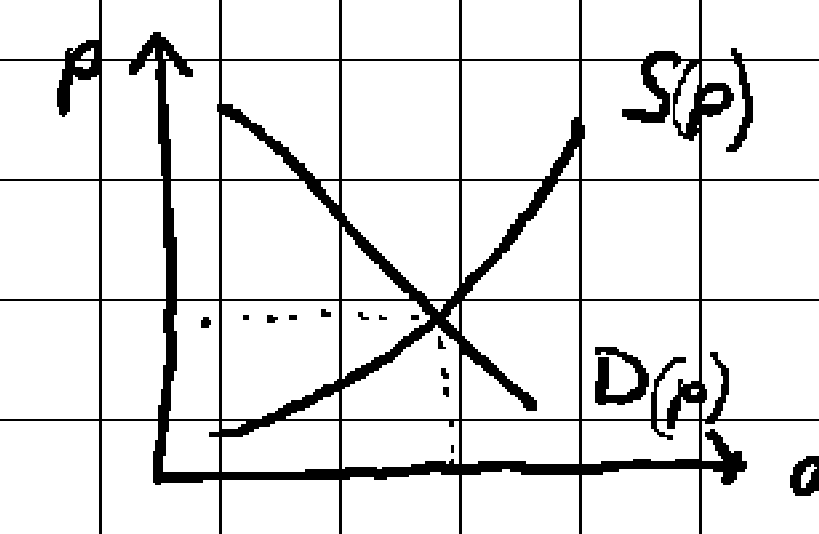
$$S(p) = \int_0^1 q_i(p) \, di$$

S = market supply
q_i = quantity firm i supplies

Market Equilibrium

↳ we can calculate the optimal price when

$$D(p) = S(p)$$



Short Run vs Long Run Equilibrium

Short Run: only look at firms as price takers and homogeneous goods

Long Run: free entry assuption

↳ additional firms will only enter the market as long as profits are positive

↳ This lowers everyones profits

Monopoly

A Monopoly has an inverse Demand Function $P(q)$ as it can sell more for a lower price.

$$P(q) = D^{-1}(q)$$

$D^{-1}(q) \rightarrow$ price at which one can sell exactly q

The Profit is therefore

$$\pi(q) = q \cdot P(q) - C(q)$$

Problem of the firm in a Monopoly

↳ maximize profit $\pi(p)$

$$\Rightarrow \quad \underbrace{P(q) + q \cdot P'(q)}_{\text{marginal revenue}} = \underbrace{C'(q)}_{\text{marginal cost}}$$

$$\Rightarrow \quad R'(q) = C'(q)$$

$$\Rightarrow \quad P(q) > C'(q)$$

$\Rightarrow$ choose q, so that $p > C'(q)$

Monopolist Markup

Lerner Index

↳ Degree of market power a firm has

$$L = \frac{P(q) - C'(q)}{P(q)}$$

Price Elasticity

↳ how much does quantity Demand respond to a change in Price

$$E = \frac{\frac{\Delta q}{q}}{\frac{\Delta P(q)}{P(q)}} = \frac{\Delta q}{\Delta P(q)} \cdot \frac{q}{P(q)}$$

Total societal value Produced

↳ satisfies

$$R(q) = \int_0^q \left(P(x) - c'(x)\right) dx$$

Quantity maximize social welfare

↳ satisfies

$$q: \quad P(q) = c'(q)$$

Consumer Surplus

↳ difference between what a consumer is willing to pay and what he actually paid

$$CS = \int_0^q \left(P(q) - p\right) dq$$

Producer Surplus

↳ difference between what firm gets for a product and what it cost to produce it

↳ firms profit

$$PS = \int_0^q \left(p - c'(q)\right) dq$$

$\Rightarrow$ Production is efficient if $R(q) = CS + PS$

Dead weight loss (DWL)

↳ loss in total welfare because of the monopolist production that is less than the competitive quantity

~ socially optimal quantity

$$DWL = \int_{q^m}^{q^s} \left(P(q) - C'(q)\right) dq$$

quantity choosen by monopolist

Oligopolistic Competition

Cournot (Quantity) Competition

↳ firms compete on the quantity that they can output rather than price

Market Demand is given by a decreasing Function $P(Q)$ with Q beeing the total quantity of goods produced by all firms

Profit is thus given as

$$\pi(q) = P(Q)q - C(q)$$

The best Response for a change by another firm can be calculated as:

$$BR_1(q_2) = \max\left\{0, \frac{a-c-q_2}{2}\right\}$$

$$BR_2(q_1) = \max\left\{0, \frac{a-c-q_1}{2}\right\}$$

$c \to$ marginal cost

$a \to$ parameter of demand function (ex. maximum price)

$\hookrightarrow P(Q) = a - Q$

$Q = \sum q$

Mutual optimal quantities

$$q_1 = q_2 = \frac{a-c}{3}$$

Profits

$$\pi = \left(\frac{a-c}{n+1}\right)^2$$

no. of firms

Price

$$P = \frac{1}{n+1} a + \frac{n}{n+1} c$$

Betrand (Price) Competition

↳ firms compete in prices

→ Firms choose prices p

↳ based on their prices they receive a Demand $D(p)$

⇒ consumers buy the cheaper option

Bertrand Paradox

↳ choose optimal price given the price of another firm

$$\Rightarrow \quad p_1 = p_2 = c$$

⇒ This drives prices down, as you can gain alot by undercutting the competition

→ prices near the marginal cost (low - zero profit)

Vertical Foreclosure

Upstream Bottleneck

↳ some sort of cause upstream that has an effect further down for dependent ex. firms

→ upstream monopolists actions effect downstream markets

ex. upstream: operating system
downstream: apps

Vertical Foreclosure

↳ Monopolist restricts/hinders access to goods for downstream competitors

→ complete Foreclosure → refusal to deal with competitors

→ partial Foreclosure → higher price for competitor
↳ lower quality for competitor
↳ cap supply
⋮

⇒ There are laws that try to regulate this but terms like controll, essential & monopolist have an unclear meaning ⇒ hard to govern

Game Theory

↳ tools to analize strategic interactions between rational players

The Single-Person Decision Problem

↳ Tuple (S, u) where S has different actions and u is the function that maps S to a payoff

⇒ Profit of the monopolist

$$u(s) = \underbrace{sP(s)}_{\text{inverse market Demand}} - \underbrace{C(s)}_{\text{total production cost}}$$

Games

↳ each player has a set of actions

↳ each player has a utility function (can be different)

- Static Game → players action are taken simultaniously
- Dynamic Game → players action are taken one after another
- Complete Information → payoff functions are common knowledge
- Incomplete Information → payoff functions are not known by all players

Game Types

	Complete Information	Incomplete Information
Static Game	cournot competition	Static auctions
Dynamic Game	vertical Foreclosure	Dynamic auctions

Finite Game

↳ no. of strategies are finite for each player

⇒ any two player finite Game can be represented with a payoff matrix

$$
\begin{array}{cc|ccc}
 & & & P_2 & \\
 & & s_1 & s_2 & s_3 \\
\hline
P_1 & s_1 & (a_1,a_2) & (b_1,b_2) & (c_1,c_2) \\
 & s_2 & (d_1,d_2) & (e_1,e_2) & (f_1,f_2)
\end{array}
$$

strategy

(payoff P_1, payoff P_2)

row = P_1 strategies

columns > P_2 strategies

Nash Equilibrium

↳ when all players play their optimal action

↳ action s_i is the players best response to the action s_j

⇒ Nash Equilibrium = mutually best responses

Dominant strategy

↳ optimal strategy no matter what the other players do

↳ possibility to miss out on the socially optimal outcome because of rational thinking and picking the dominant strategy.

Pure vs Mixed strategy

Pure → all players choose the best strategy

Mixed → all players choose a strategy that has a certain probability for a higher payoff

Mixed strategy

		B	
		c	d
A	a	$a_1 c_1$	$a_2 d_1$
	b	$b_1 c_2$	$b_2 d_2$

Probability p that A plays a and $1-p$ for b
Probability q that B plays C and $1-q$ for d

Expected payoff for A if he chooses a :

$$a_1 \cdot q + a_2 \cdot (1-q)$$

Following this strategy, we can compute p and q

$$p = \frac{b_2 - a_2}{(a_1 - b_1) + (b_2 - a_2)}$$

$$q = \frac{d_1 - d_2}{(c_2 - c_1) + (d_1 - d_2)}$$

<u>OR</u>

Expected payoff for A if he chooses a
=
Expected payoff for A if he chooses b

$\Rightarrow$ Solve for q

(same for p with player B and his options)

Dynamic Game can b

↳ can be modelled as a decision Tree

↳ player 1 plays first

↳ player 2 will choose best response

↳ player 1 knows that player two will choose his best option and can therefore choose own play based on this knowledge to maximize own payoff (first move advantage)

⇒ mutual best Response = Nash Equilibrium

Extensive Form Game

↳ Sequential Decisions in a Game

Information set

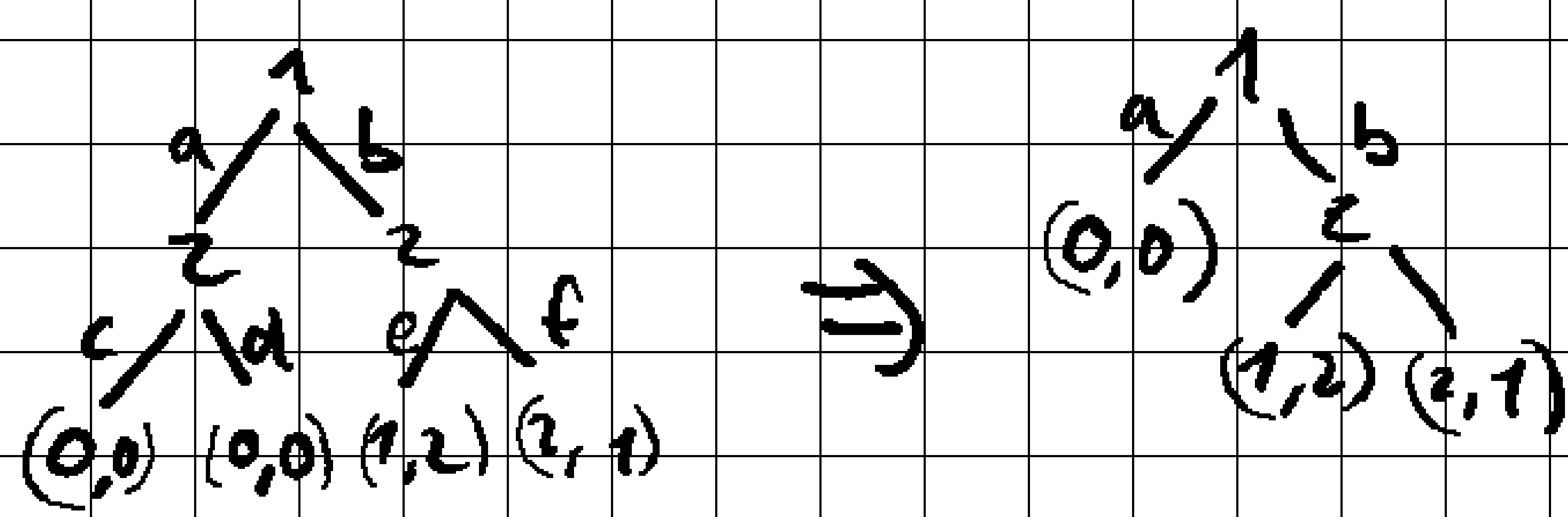
↳ At each Decision point in the Game, a player only knows the Information of the current available choices, not the previous or future ones.

Singelton information set → exactly one Decision Node

non singelton Information set → multiple Decision Nodes

Normal Form Game

↳ A Game can be converted to a Normalform by summing up Decisions with the same payoff

⇒ 

Sequential Rationality

↳ a Player behaves rationally on and off the equilibrium path

⇒ always the best response for each Information set.

Backward Induction

↳ finding the best strategy by walking the game back and checking alternative routes for a better outcome

⇒ Nash Equilibrium

Subgame - Perfect Nash Equilibrium

↳ a perfect game in every subgame
↳ a Subgame is a part of the game, stating at any Decision Node and considering only future Decisions.
⇒ any portion of the game that can be considered a game on its own.

⇒ A Game is a Subgame - Perfect Nash Equilibrium if every subgame represents a Nash Equilibrium in every single Subgame

Non subgame - Perfect could mean that a optimal final outcome was reached, but somewhere along the way was a not optimal decision.

(A subgame cannot cut a Information Set)