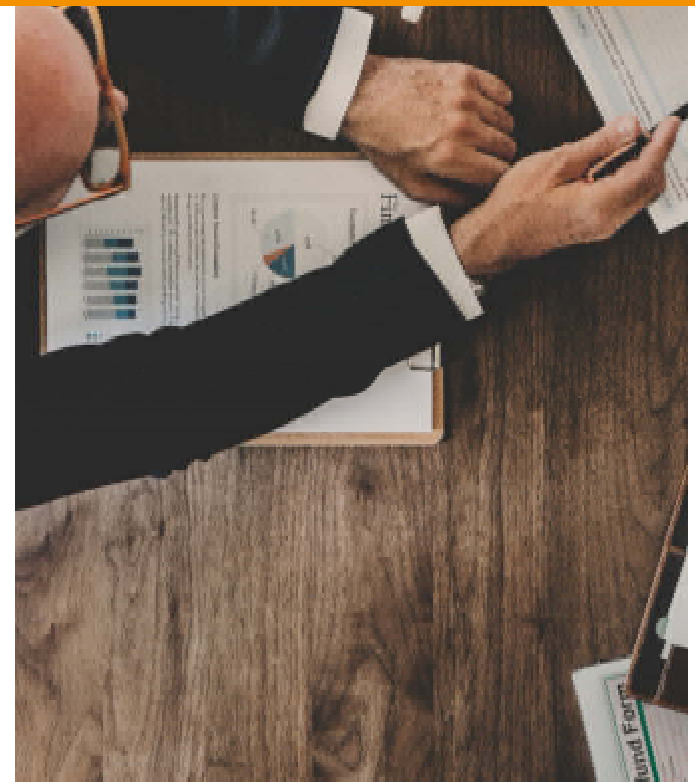
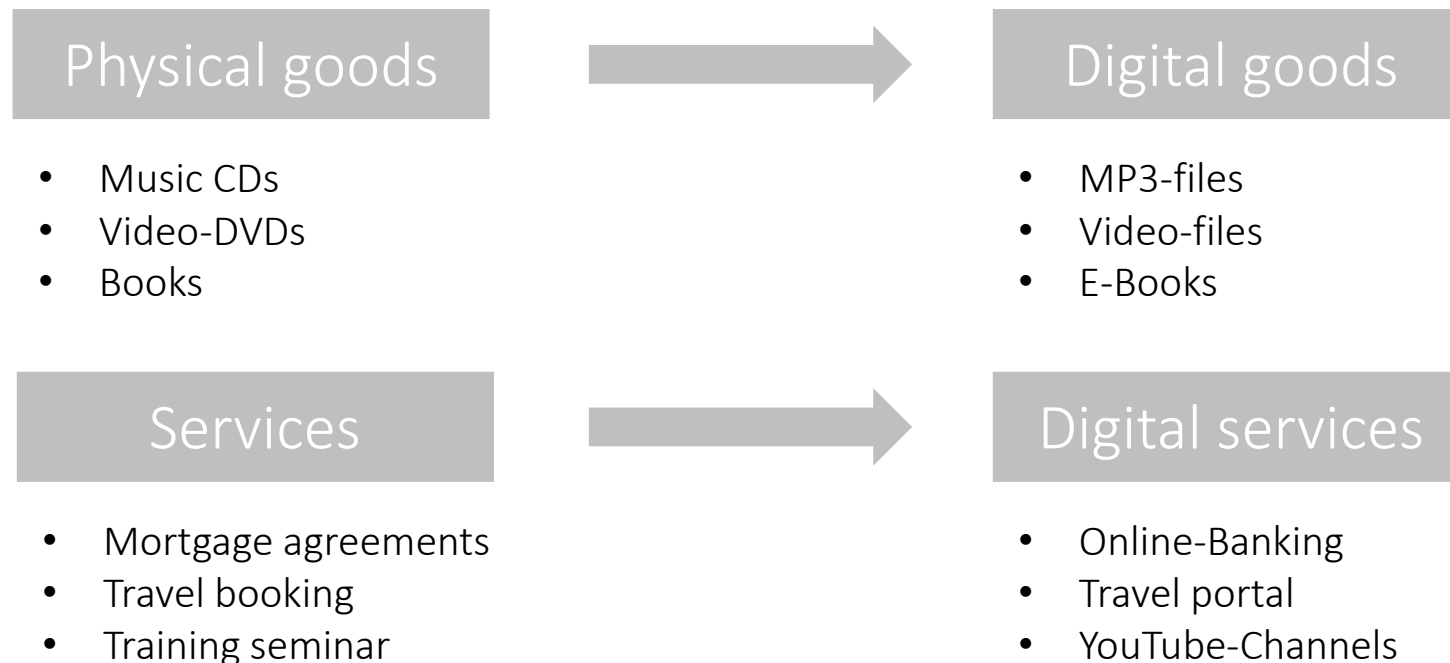


Digital goods and services



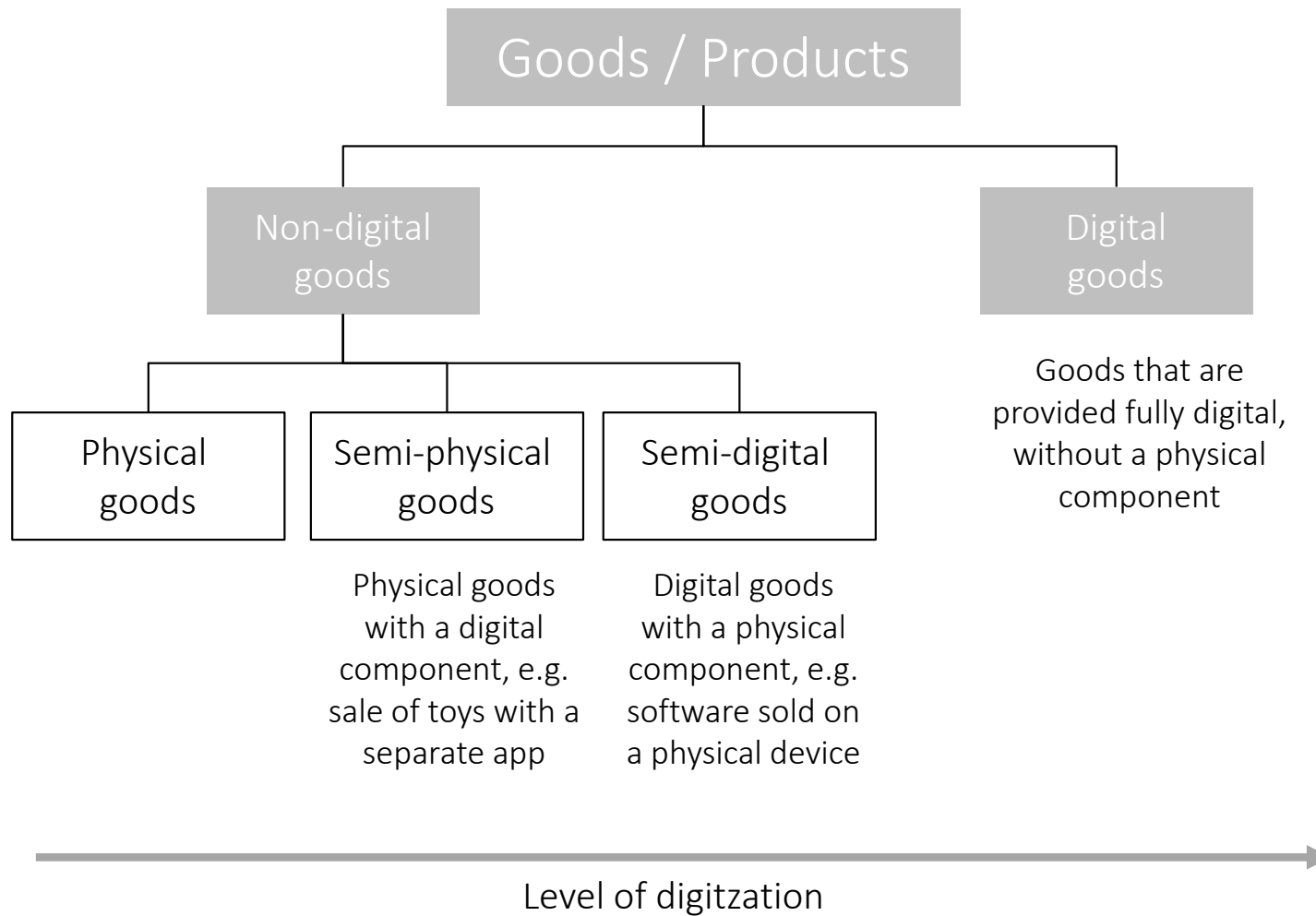
Digitization = Trend towards digital goods and services



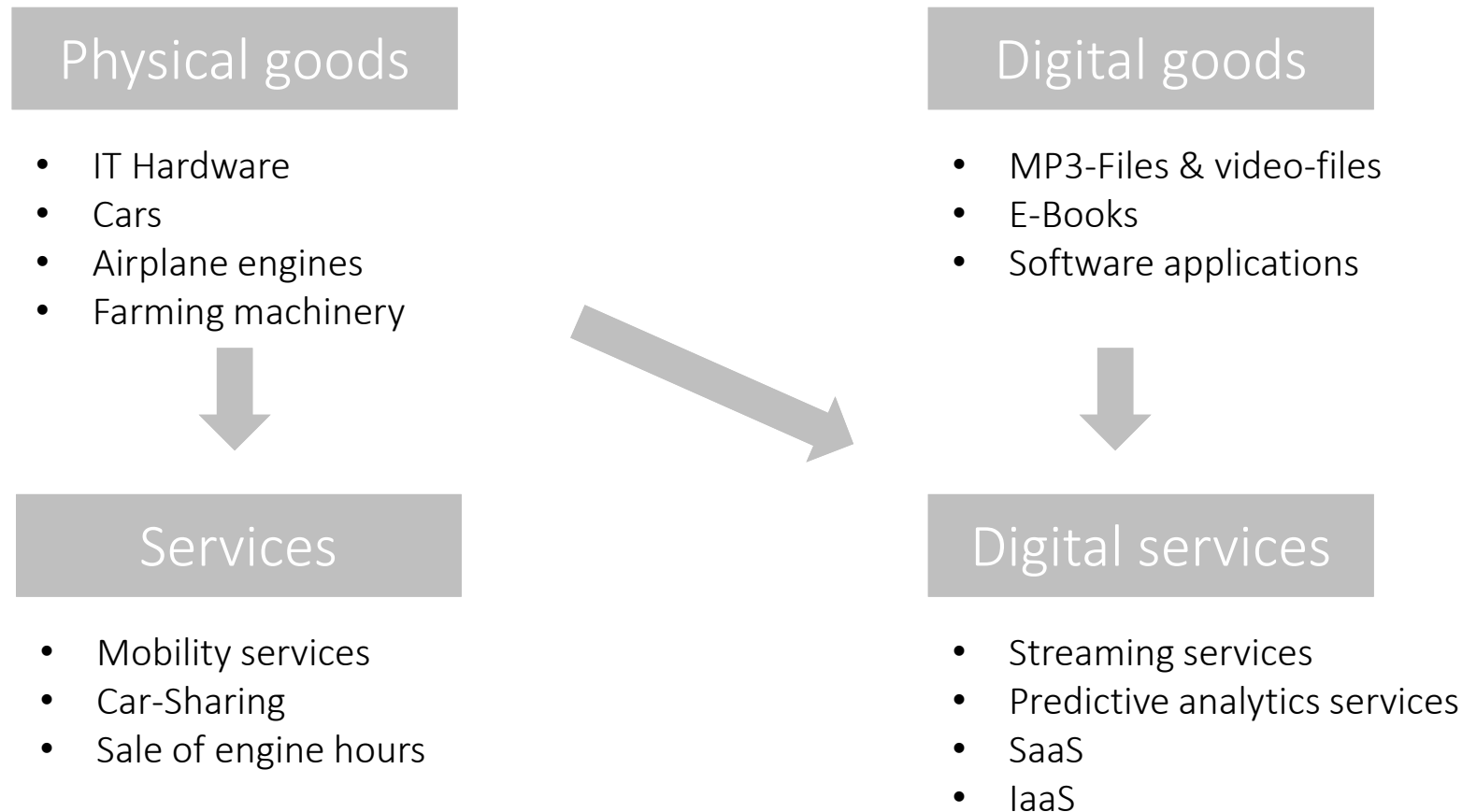
Digitization = Converting something into a digital format

Digital good = An intangible good/product that is represented in a purely digital format





Trend towards (semi-)digital services



Service Strategies = Companies strive to replace traditional product business by services.

What are the advantages of services over traditional products from a company's perspective?

Distinctive characteristics of digital goods

Digital goods and services show some characteristics that are very different to „traditional“ or physical products that are exchanged on markets.

Some of these distinctive characteristics are responsible for a significantly different market behaviour of digital goods.

Business example:

You have an idea for an innovative new board game. It is a mix between „monopoly“ and a card game. The storyline is new, but you already have some general ideas on the rules and game instructions. That's it so far.....

In general you are thinking about three alternative ways to produce and sell the game.

- A) As a **physical board game** that is sold in internet stores. After COVID you expect people to enjoy meeting up and engaging in such evening-filling games again.
- B) As a **software application** which can be downloaded from a store and installed on a computer.
- C) As a **cloud based software** with a **mobile app**. This would allow people to virtually play together.

Distinctive characteristics of digital goods

Digital goods and services show some characteristics that are very different to „traditional“ or physical products that are exchanged on markets.

Some of these distinctive characteristics are responsible for a significantly different market behaviour of digital goods.

Production process: What steps are required for the production of one additional unit?

Logistics: How is the product distributed to the client? How is it stored, transported, delivered?

Adaptability: In case the product has to be changed or corrected, how can this be done?

Reproducibility: How easy is it for the producer / the consumer / the competition to reproduce the product?

Wear-freeness: Does the product lose value if it is used?

Trust-problem: How difficult is it to judge the product's quality before purchase?

Distinctive cost structures of digital goods

One very central difference between digital and physical goods is their cost structure.

Understanding the cost mechanics of a business model and the effect on market dynamics is key to understand if a digital business model can be sustainable.

Business example:

You now focus only on two alternatives for the board game.

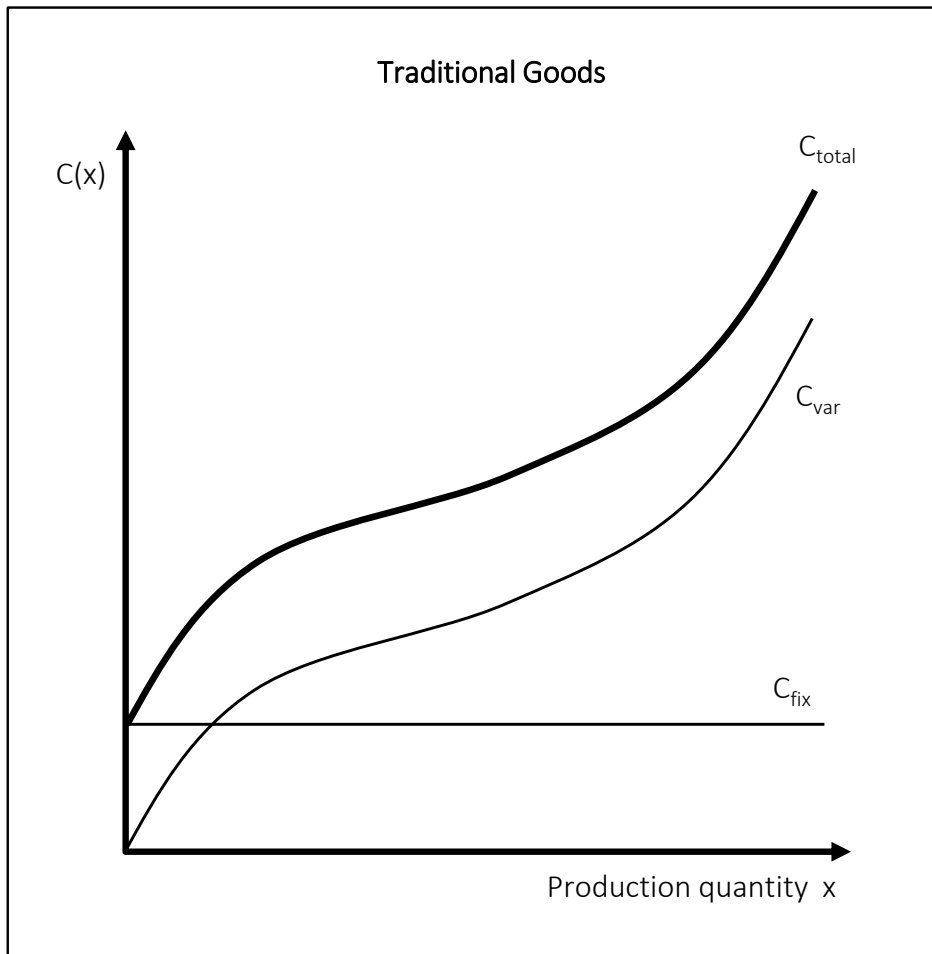
- A) As a **physical board game** that is sold in internet stores. With your small company you can currently produce a maximum of 250 units per day. The optimum utilization of your company is at 150 units per day.
- B) As a **cloud based software** with a **mobile app**. You plan to use both the Apple and Android app stores.

Question 1: What activities are needed in order to be ready to go to market, i.e. until the first unit is ready for sale? Compare alternative A and B.

Question 2: What costs will be incurred in order to produce and deliver ONE unit of the board game? Compare alternatives A and B.

Question 3: Which of the costs discussed before depend on the number of units sold per period?

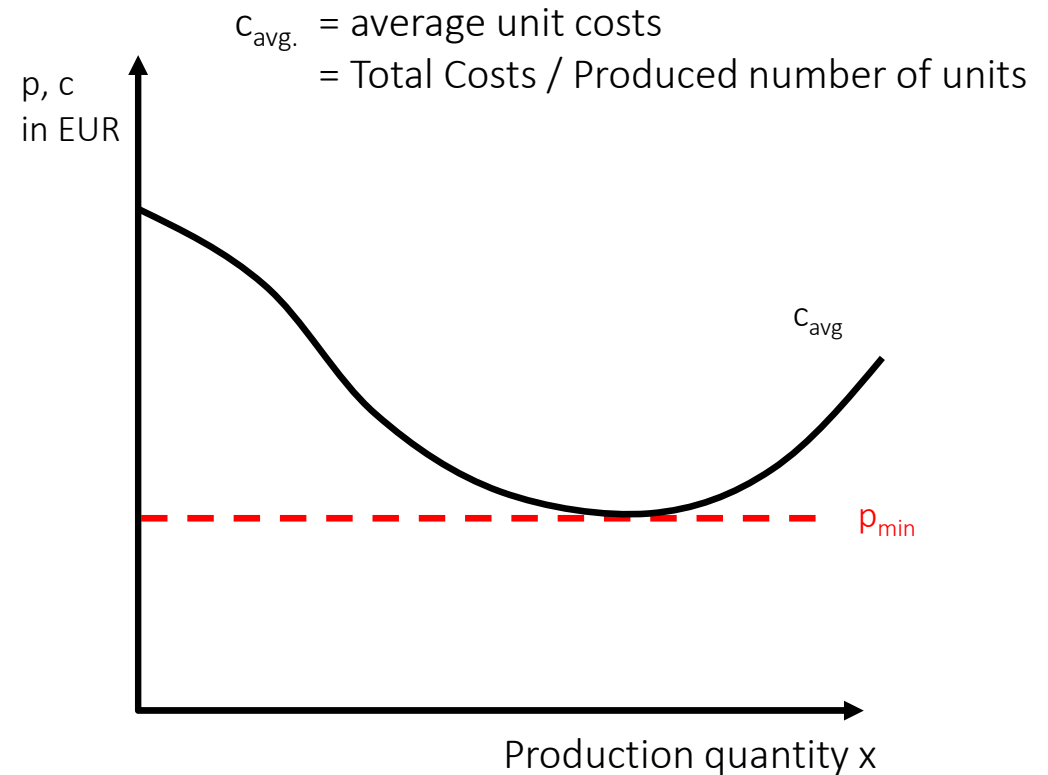
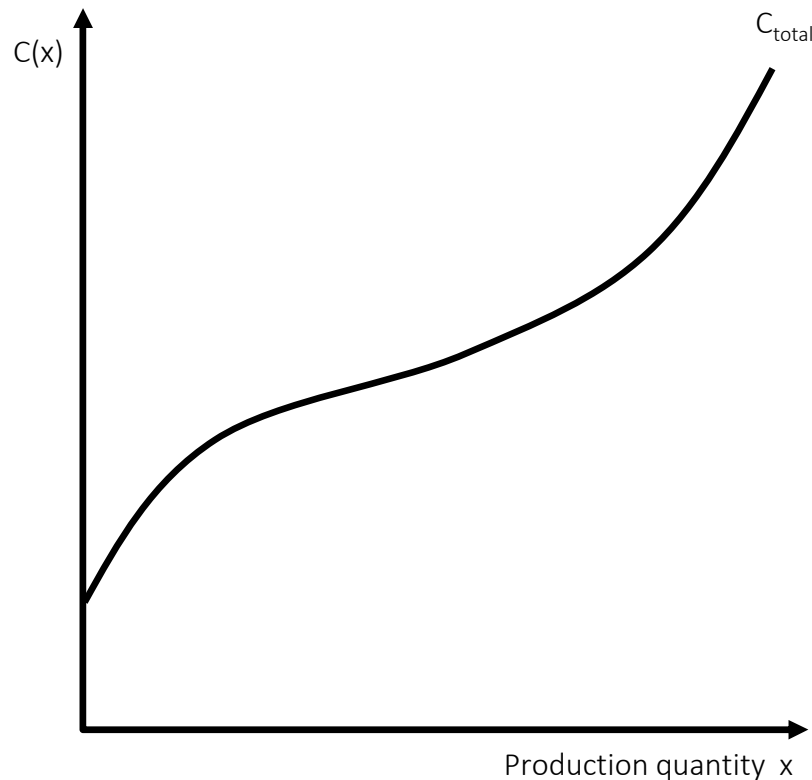
Cost structure of traditional goods



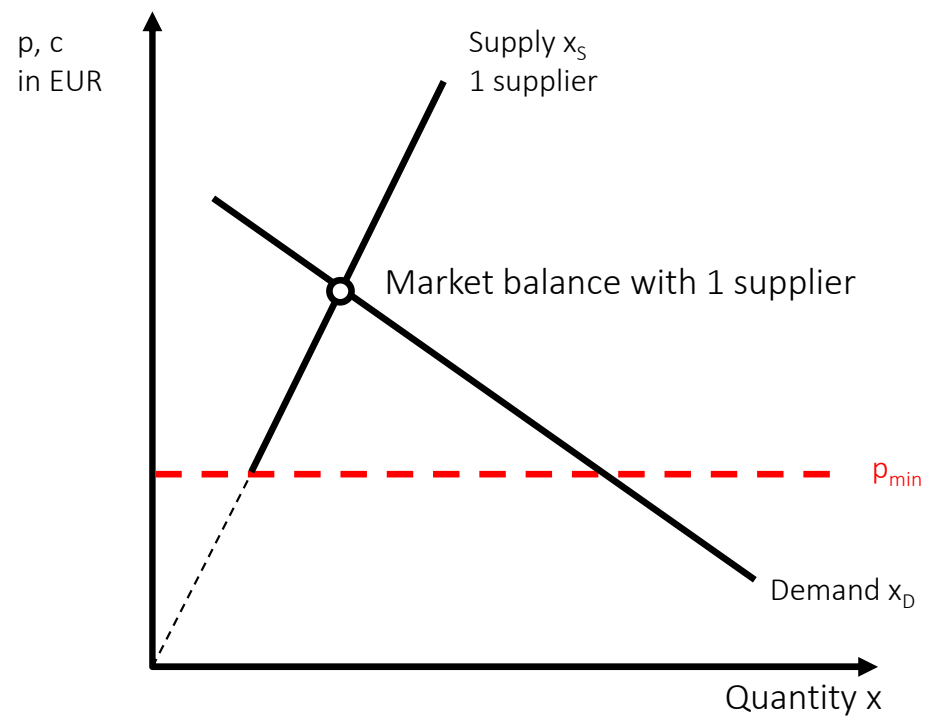
- C_{fix} = Fixed Costs independent of the number of units produced per period.
- C_{var} = Variable Costs dependent on the number of units produced per period..
- C_{total} = Total Costs per period

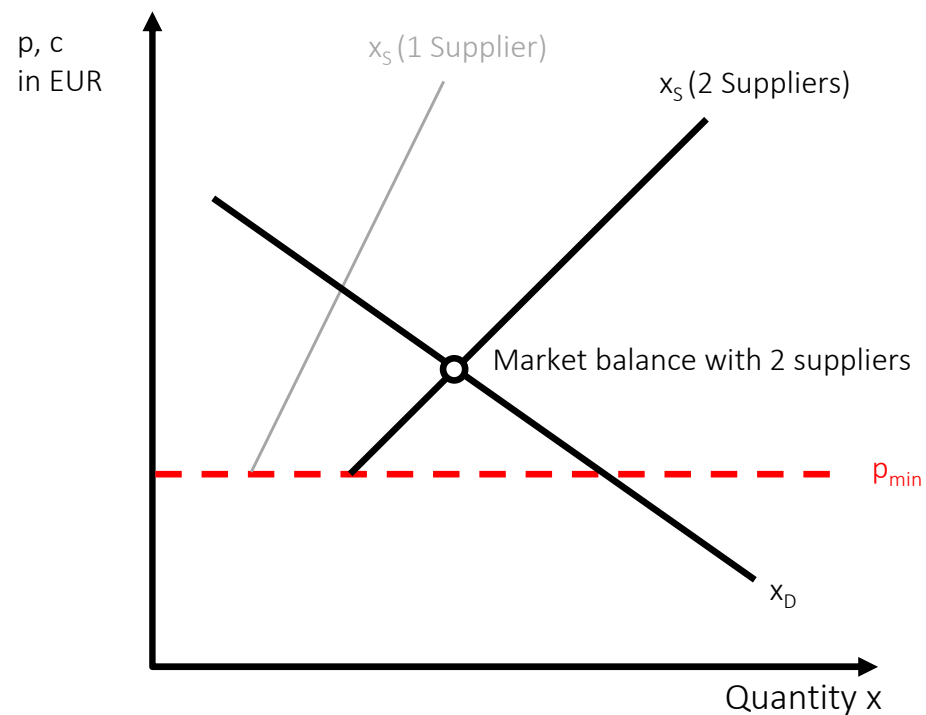
- There is an optimal utilization / workload for the existing capacities
- There is an upper capacity limit

Unit costs and break-even price for traditional goods

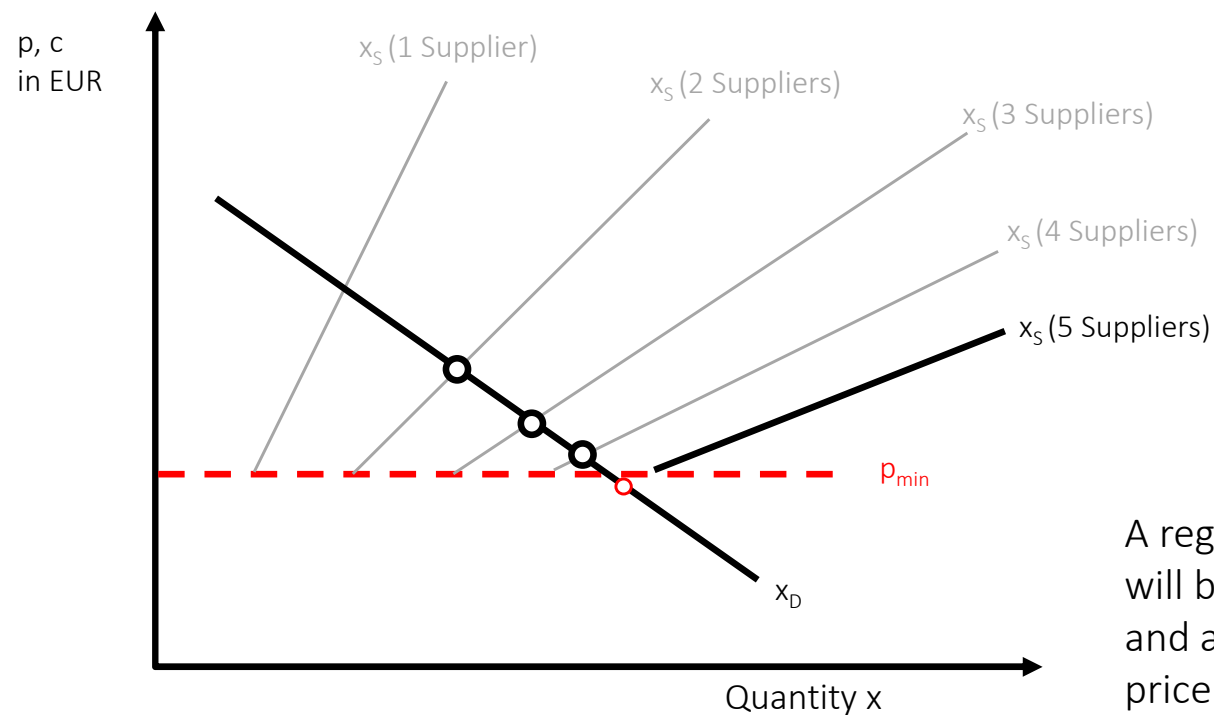


p_{min} = Long-term price floor = minimal price the company needs to achieve in order to avoid losses. If the market price falls below the average costs per unit, it is not possible for the company to produce any number of units per period that allows to cover its costs.



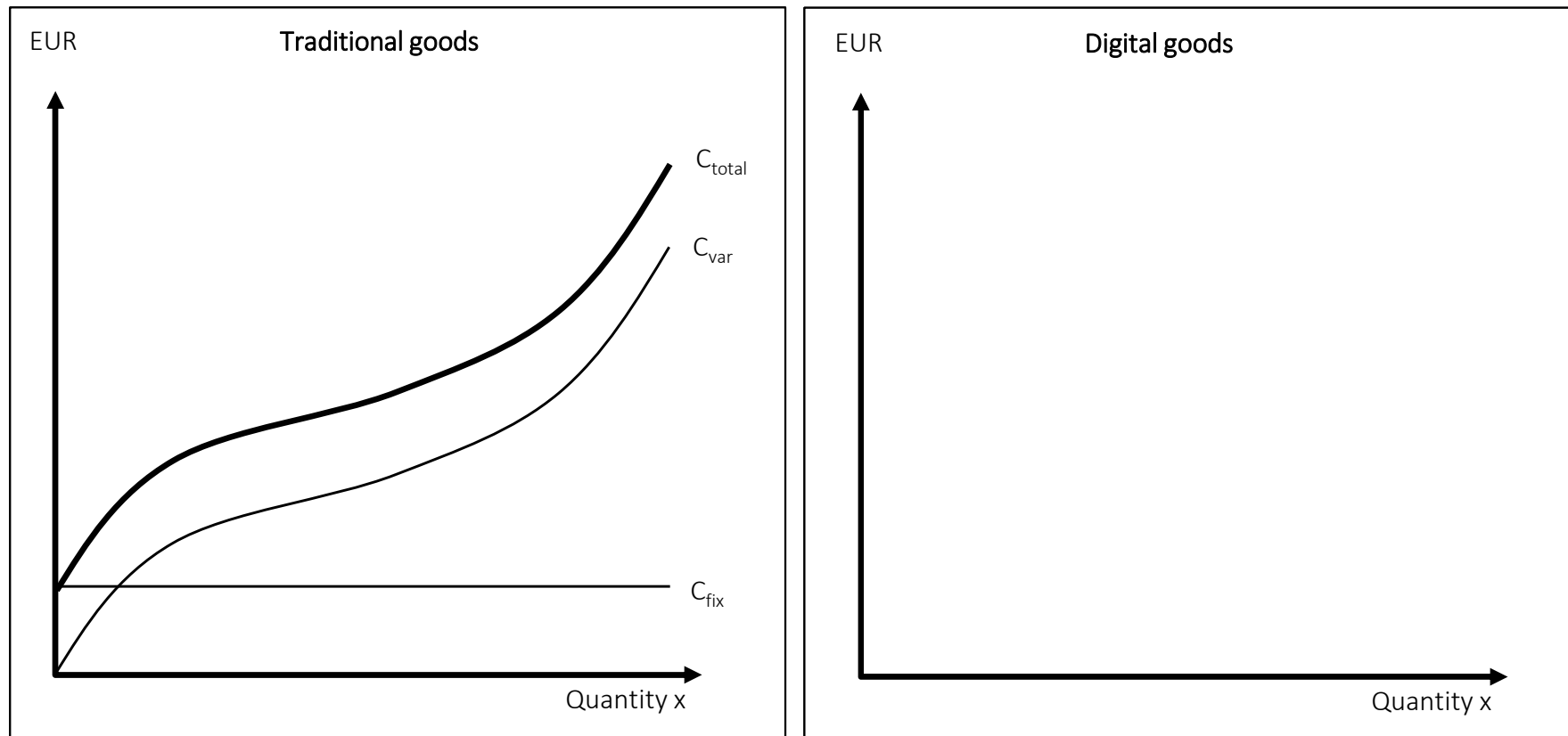


Critical assumption to simplify the model: Each supplier has EXACTLY the same production logic, same cost structure und therefore same minimal price floor.

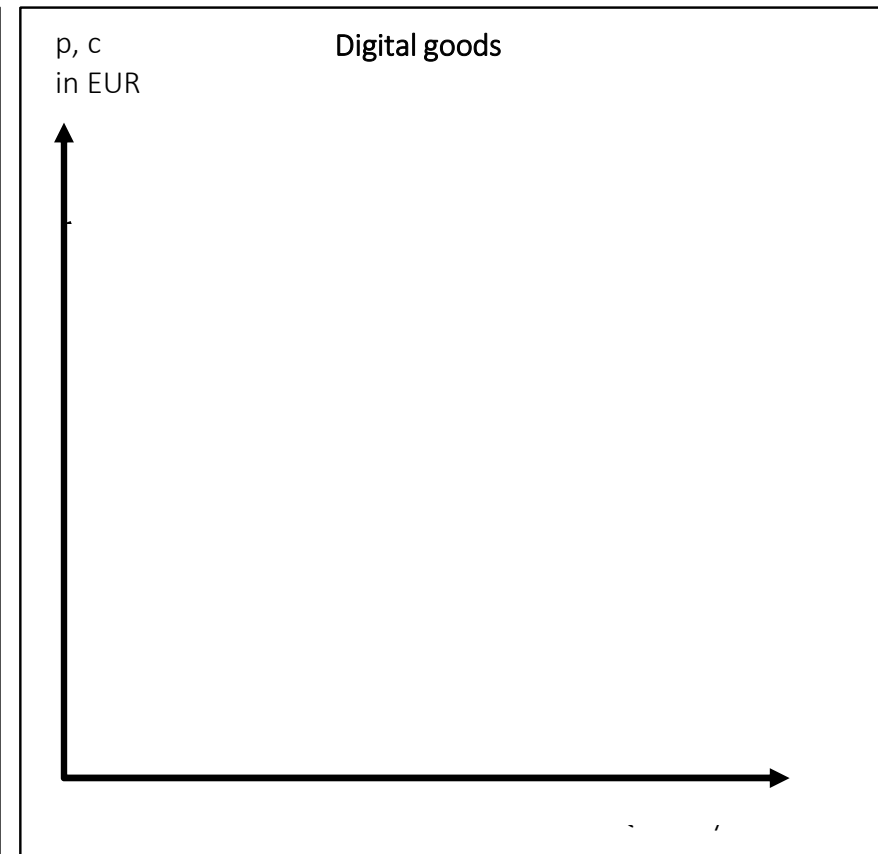
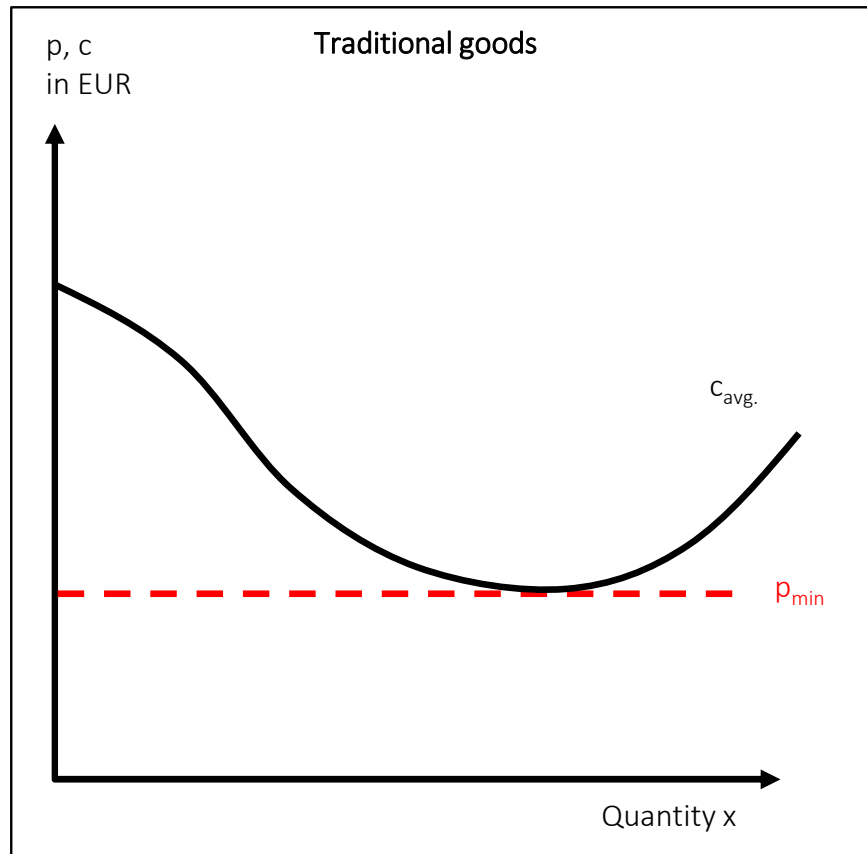


A regular working market will balance with 4 suppliers and a price slightly over the price floor of the competitors.

Cost structure of digital goods



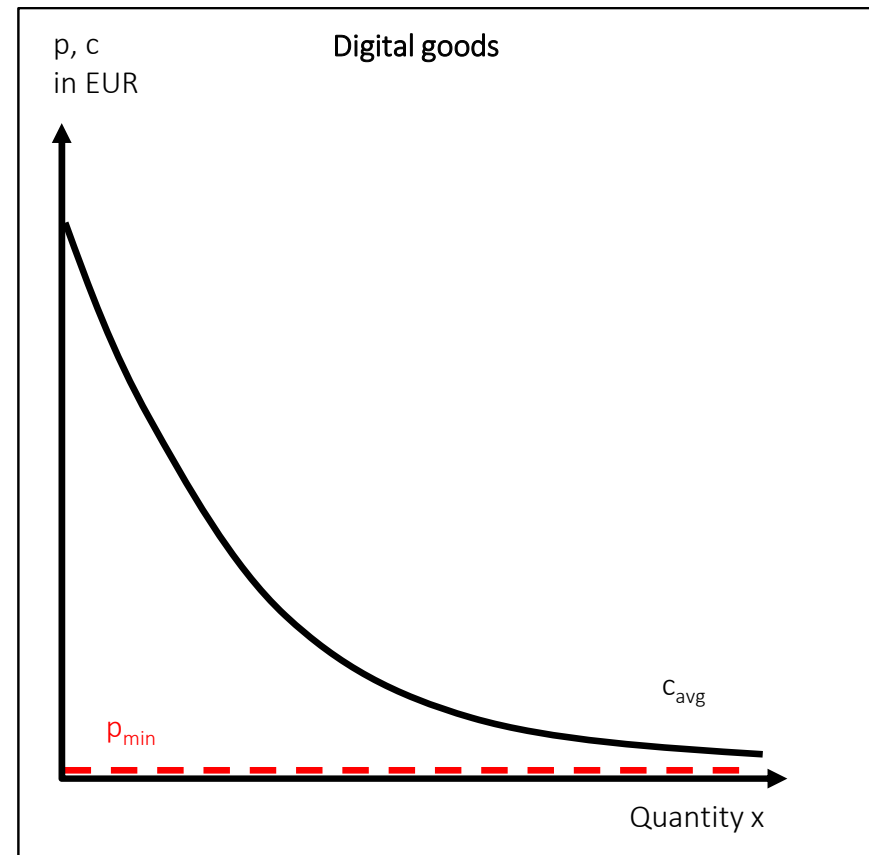
The extreme case of a linear cost function is called **subadditive cost function**: Every quantity of units can best (= with lowest overall costs) be produced by exactly one supplier!



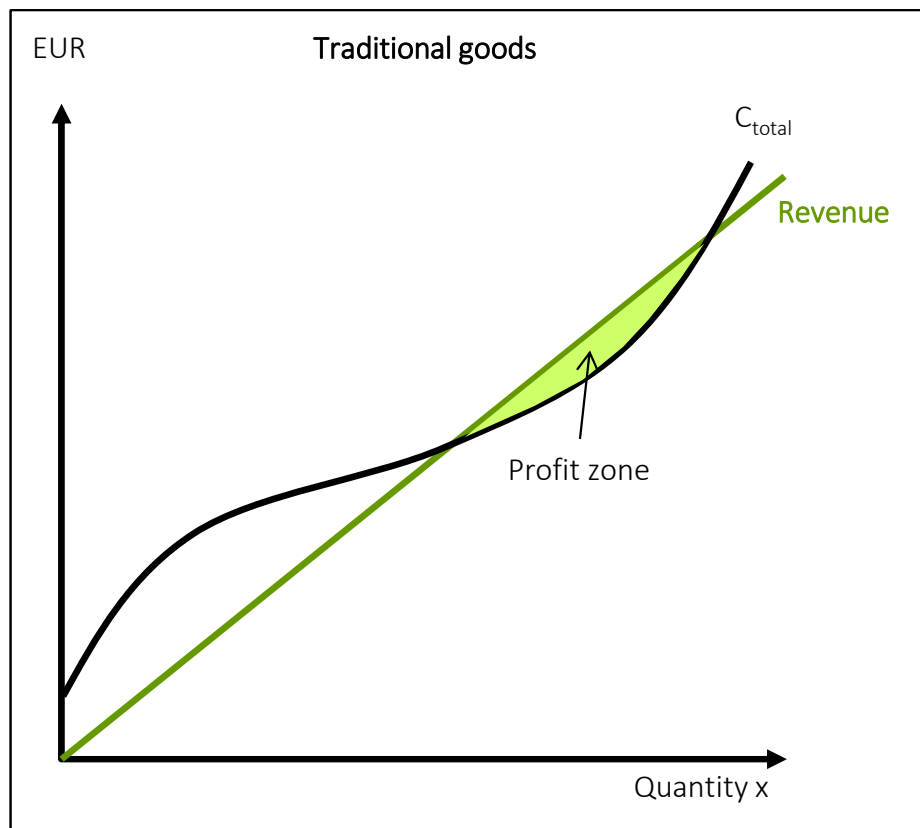
Price floor for digital goods

⇒ Purely digital goods do not have any effective price floor. There is no breaking-point in the sense of a lower price which competitors would not go below.

Question:
How will this affect competitive behaviour?



Break-even point and profit zone for traditional goods



With traditional goods there is a profit zone and a quantity where the maximum profit per period is reached.

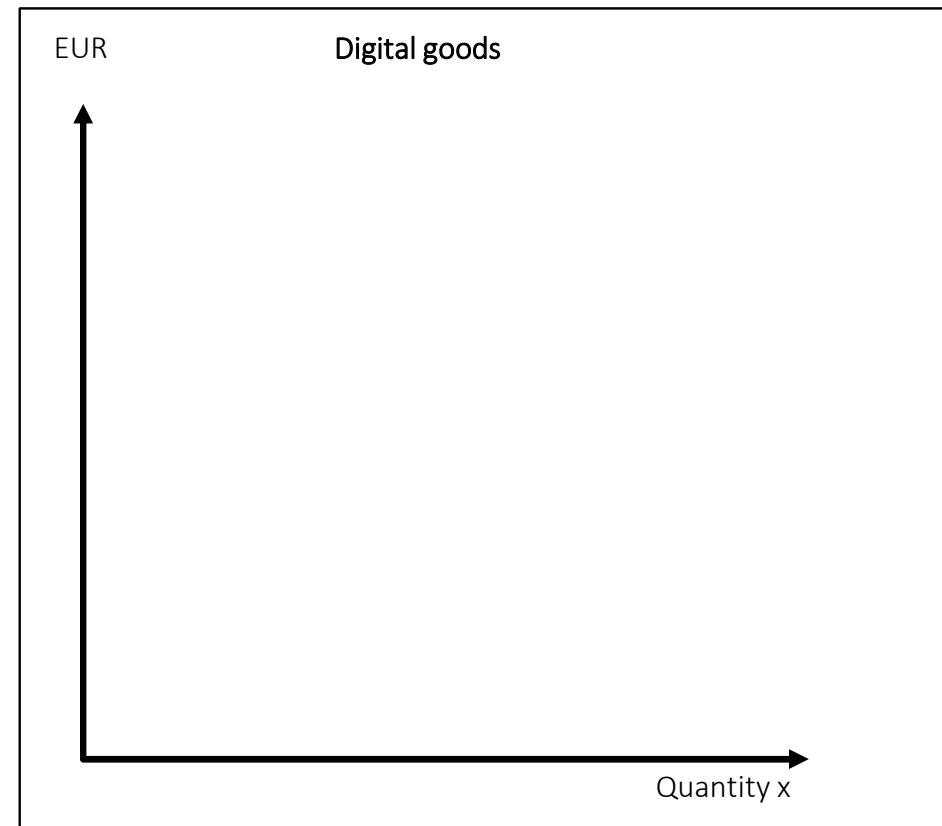
It is not necessarily better to produce more units. The profit per unit will actually decrease after the profit optimum is reached. If a company exceeds a critical capacity limit, the overall profit might turn negative.

Break-even point and profit zone for digital goods

For digital goods the profit per unit will increase after a break-even-quantity is exceeded.

It is always beneficial to produce more units.

The higher the fixed costs are and the lower the variable costs per unit, the stronger this effect will be.



Paradox market mechanism – The Bertrand Competition

For digital goods the assumptions of the **Bertrand Competition** are largely fulfilled:

- Duopolistic structures (few suppliers – few consumers)
 - Full price transparency for the buyers
 - No difference in variable costs of producers (here: almost zero)
 - Homogenous product where consumers are indifferent
- ⇒ While usually a monopoly gives market power to the producer and allows to set a monopoly price that offers increased profits to the monopolist, these market structures lead to paradox effects:
- ⇒ On entry of ONE competitor a disastrous competition will be triggered (**War of Attrition**), at the end of which one monopolist will remain.
- ⇒ The remaining monopolist will have no economic benefits anymore, as the price was ruined during the competition.

Example: Microsoft versus Netscape 1995-1999.

Summary: Market mechanism in digital goods

- The specific cost structure of digital goods and service facilitate a market concentration up to a monopoly.
- High First Copy Costs delay the break-even-point. Producers try to reach this point as quickly as possible.
- After the break-even-point is reached, profits increase with every unit sold. Therefore the extension of own market presence is of highest importance. Volume is most important. Network effects (see later) even enforce this effect.
- Low and linear variable costs reduce the price floor. This disables an important market control mechanism that usually limits price competition.
- The full price transparency in digital markets adds to that. Customers can identify the cheapest option immediately and without costs. Therefore price reductions show immediate effects.

A special kind of new digital product: NFTs



Durable goods - the problem of digital goods not „wearing out“

Contrary to physical goods, digital goods do not lose value when used. They do not wear out. They are **durable goods**.

- ⇒ There is no need to replace them (= no replacement purchases)
- ⇒ „Used“ goods can theoretically be a direct competition to „new“ goods sold by the producer. They don't show any reduced value compared to originals.
- ⇒ „Used“ goods that show up on the market after a while will reduce the demand for original products.
- ⇒ Suppliers therefore need to reduce their prices after a while to compete with the used goods.
- ⇒ Frequently a „**Skimming-Strategiy**“ is applied to gain profits before this effect happens.
- ⇒ But: Consumers will understand this mechanism => They might delay their purchase to benefit from reduced prices.

Durable goods - the problem of digital goods not „wearing out“

- ⇒ But: Consumers will understand this mechanism => They might delay their purchase to benefit from reduced prices.
- ⇒ Producers try to conceal the price reductions:
 - ⇒ Artificial loss of utility/value over time: Licenses, TimeStamps, device-specific products, copy protections
 - ⇒ Avoiding comparability by constantly re-structuring offers, new names, new service bundles etc.
 - ⇒ **Transformation into services!** Due to the significant problems of digital goods, producers prefer to sell services instead: Examples: Software becomes SaaS, Videos become Streaming-Services

Ronald Coase has developed an economic model for the case where a monopolist enters the market with a durable good.

He shows that a monopolist will lose his monopoly benefits fully if he offers a **durable good** and if he **is able** to reduce prices. („**Coase Conjecture**“). Reason: The consumer will delay the purchase as long as the price is above the price that would be paid under full competition assumptions.

=> Durability of products is actually a problem for producers.

NFTs – Digital certificates of genuineness

NFTs change the characteristics of digital goods. They avoid digital goods from being copied and spread in the market. Instead, they basically offer a digital certification of genuineness. Therefore, they are the basis to certify that one unit of a digital good is owned by a specific person. What is being sold therefore is not necessarily a good, but a token that proves you are the owner of the digital good.

These NFTs (**Non Fungible Tokens**) are stored in a blockchain.

NFTs make it possible to sell individual units of a digital product. They make uncontrolled multiplication impossible.

NFTs will most probably change the market models for many digital goods.

NON-FUNGIBLE-TOKENS (NFT)

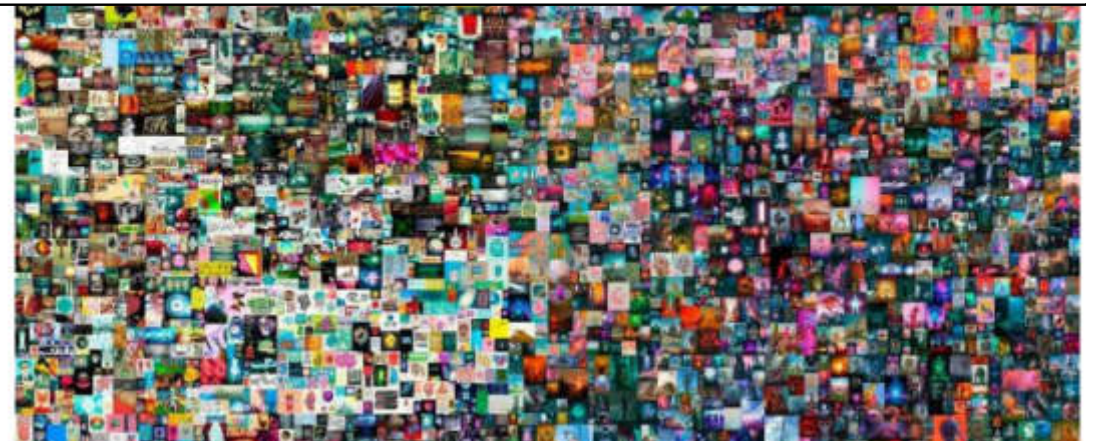
Krypto-Auktion: Rätsel um mysteriösen Käufer von 69 Millionen Dollar teurem Digitalkunstwerk gelüftet

Ein Käufer mit dem Pseudonym Metakovan erwarb vergangene Woche digitale Kunst für einen Sensationspreis. Nun ist klar, wer sich hinter dem Geschäft verbirgt – und was den Investor antreibt.

1. Beeple's \$69 million sale

No article on NFTs is complete without Beeple's historic **\$69 million NFT auction**.

The artwork, *Everydays: The First 5000 Days*, is not only the most expensive NFT ever sold, but also the third most expensive artwork sold by a living artist, and the first NFT to be sold at a fine art auction house.



NFTs – Digital authenticity certificates

NFTs will enable totally new business models. A previously unknown new demand for digital products in the virtual world becomes possible.

Examples

- Digital art
- Digital fashion
- Digital goods for virtual worlds
- Digital goods for gaming

NFTs allow providers to create an artificial shortage of supply. This stops the otherwise typical price decline in digital goods. It has the potential to disrupt the digital markets. But they also hold significant risks.

