

# Consumers, Producers and Efficiency of Markets + Externalities and Public goods

V. Hajko

2016

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- 3 Producers and willingness to sell
- 4 Efficiency
  - Market efficiency
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  - Externalities
  - Positive externalities
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# Surplus, welfare, and welfare effects

- Lecture covers Chapters 7, 10, 11
- This is a rather abstract lecture, but with strong implications
- What is individual demand?
  - What is a consumer surplus?
- What is individual (firm's) supply
  - What is a producer surplus?
- What is understood as efficiency?
  - How is it related to markets?
- Why governments intervene?
  - What is welfare analysis?
  - What are externalities?

# Markets

- The study of economics examines how **market participants** (individuals, firms and governments) make decisions to allocate limited resources
- Typically they make decisions on the markets
- A market is a place where goods or services are being bought and sold
  - **Free market** is based on **voluntary decisions** of the market participants
- What if a government wants to do something?
- What if there are multiple options to do something (e.g. levying a tax vs. quotas)?
- What if the market outcome is not deemed as desirable?

# Price

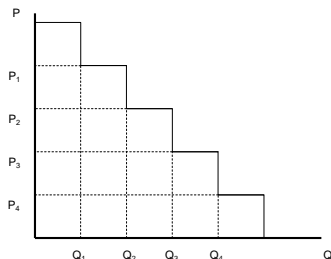
- In order to exchange the goods and services, the market participants use **prices**
  - a price in general will carry as a tool to automatically exchange information between market participants
  - a price is a result of demand and supply interaction
  - both demand and supply are functions of prices
- The determination of a price is not depending on the existence of money, you can exchange one apple for two tomatoes
- If you wish to enter multiple markets, it is inconvenient to follow that one apple = two tomatoes, one tomato = 3 pears, 1 pear = 0.3 liter of milk etc.
- If you choose e.g. an apple as the measure of value, you are using this apple as the so-called "numéraire"
- *Numéraire* is a basic standard by which value is computed.

# Consumers

- Individuals: people entering the markets to satisfy their needs and desires
  - by consumption of goods and services
- The behavior of the consumers is governed by their effort to maximize their utility
  - by consumption of goods and services
  - but bear in mind the resources of the consumers are limited!
- The consumer has to make decisions, regarding his or her consumption, in order to gain maximum utility, using his limited resources as best as he or she can

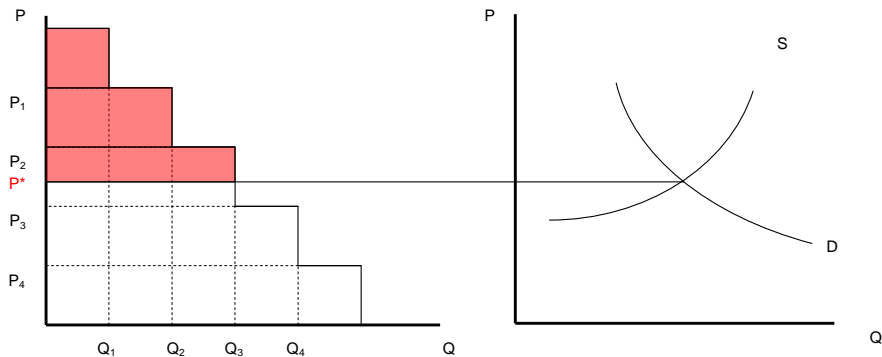
## Willingness to pay - a basis of individual demand

- The consumer is willing to pay certain *maximum* amount for a unit of goods
- If the price is lower or equal, he (or she) will decide to buy the given unit of goods - as this decision will bring him (or her) higher level of utility than alternate choices
- Consumer is a price taker, which means he (or she) will respond to the market price in his (or her) decision to buy certain amount of goods



# The consumer surplus

- If the price actually paid for the unit of goods is lower than the maximum price the consumer would be willing to pay, the consumer gains the so-called **consumer surplus**





# Law of demand

- *Ceteris paribus*, as the price of a product increases, quantity demanded falls (or as the price of a product decreases, quantity demanded increases).
- It illustrates the **diminishing marginal utility** of a given good or service for the individual consumers.
  - Market demand is constructed as a horizontal sum of *individual* demands

# Producers

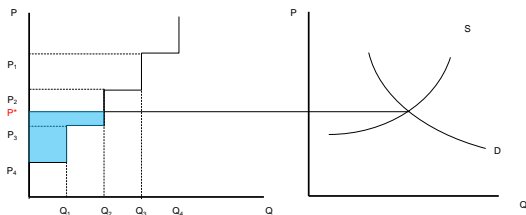
- The effort of the producers (firms) is to maximize profits
  - The owners of the production factors and the owners of the firm are eventually people, that want to maximize their utility
    - Maximizing firm's profits will lead to higher income
    - Higher income will increase the maximum attainable utility of the owners (they are also consumers)

# Producer surplus

- In a similar fashion to consumer surplus: a firm sells all its units of production for the given market price (e.g. 50 CZK)
  - however, the firm might be willing to sell various units of the production for various prices (this is called the willingness to sell)
  - e.g. the first unit of production for 10 CZK, second unit for 15 CZK, third for 25 CZK etc.
- By selling for a market price, the price for each unit is higher than what the firm would be willing to accept at the bare minimum, the firm gains a surplus - this is called **producer surplus**

# Producer surplus

- The firm can be price taker (in a perfectly competitive case), or it can influence the price to a certain extent, BUT:
  - firm will make the decision on the quantity produced based on the marginal revenue (and therefore based on the market demand!)



# Law of supply

- Ceteris paribus, an increase in a price results in an increase in the quantity supplied (or a decrease in a price results in a decrease in the quantity supplied)
  - It illustrates the **diminishing marginal returns** in production
    - if one wants to produce a higher quantity of output, it means the cost of production increases - then a higher supply price is needed to produce more

# Total surplus

- Both the producers (sellers) and consumers (buyers) gain surplus by participating in the market
- $TS = CS + PS = (\text{value to consumers} - \text{amount paid}) + (\text{amount paid} - \text{cost to producers}) \rightarrow TS = \text{value to consumers} - \text{cost to producers}$
- The total surplus is typically maximized under the free market's allocation
  - under perfectly free market conditions, no government action would be rational from the economic viewpoint

## Total surplus and the policy action

- A public policy is typically advocated as a policy that **might increase the total surplus** (above that of market's allocation)
  - That's what economists choose to believe happens in case of government interventions (politicians might follow other interests (likely their own - what is the rational behavior of a politician?) rather than total surplus)
  - This **might** hold true, if there are special circumstances, such as the monopoly or negative externalities
  - Some schools of thought consider the special circumstances as inherently temporary on the truly free market
- The typical case of welfare analysis is not increasing the total surplus above the free market's allocation (but it might increase above the market's allocation)
  - it might assist in the decision process of the selection between various scenarios (typical case: competition policy)

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# Efficiency

- The measure of the total surplus can be used to evaluate the efficiency of the "baseline scenario" (in essence, the market outcome without intervention) compared to the efficiency of the outcome of selected action (in essence, after the government intervention)
  - for practical reasons, the consumer surplus is often used as a measure of government intervention (e.g. in competition policy)
- Highest efficiency means that:
  - the optimal quantity of goods is being produced (lower amount would leave someone willing to pay more than what it costs to produce; the higher amount would mean the resources are being wasted)
  - the resources are *used in the most efficient way* (i.e. by the most efficient firms (the firms compete with each other, only those who do best "survive"))
  - the resources are allocated to *fulfill the most needed desires* (the goods are consumed by those who value them most highly)

# Pareto efficiency

- Such allocation of resources when it is *impossible* to make any single individual better off without making at least one individual worse off
  - Pareto improving action: a change in resource allocation that makes at least one individual better off *without making any other individual worse off*
- The so-called **First Welfare Theorem**: a system of free markets will lead to a Pareto efficient outcome
- Second Welfare Theorem: any efficient allocation can be attained by a competitive equilibrium, given the market mechanisms leading to redistribution (you can achieve efficient outcome if you accompany the government intervention with appropriate (wealth) redistribution policy)

# The Invisible Hand

- On the **unhampered free market** with well defined property right, the choices of the individuals lead to **optimal situation** (Pareto efficiency).
  - the market allocation of resources is decentralized (the result of interactions of large numbers of self-interested buyers and sellers)
  - there is no need for any central organization or person to "organize" the allocation of resources or expression of the needs of the buyers
  - there is no need for government interventions: the so-called "Laissez faire" (~"let them do as they will")
- This efficiency of the market processes was described by Adam Smith as "the invisible hand" of the free market
  - By following purely **individual interests**, the market participants contribute to **the highest possible efficiency of the allocation** of the limited resources, and thus to the well-being of all others
- In "special circumstances" the Invisible hand might not be sufficient

# Welfare economics / welfare analysis

- Branch of economics devoted to the estimation and evaluation of the welfare effects
- Given the First Welfare Theorem might not hold under special circumstances, government might want to intervene (to improve the outcome in terms of efficiency)
  - Democracy and the political principle of majority might set a different "socially desirable" goals for the government
    - Strict interpretation means that it would be quite difficult to prove the policy economically efficient - economists vs. politicians (+ bad economists :))
- Two major goals of any welfare analysis:
  - Is a given resource allocation efficient (compared to the "baseline result" of the market outcome)?
  - Who and how much gains and who and how much loses under various allocations?

# Welfare economics

- Policy analysis regarding
  - Regulation of market structure (e.g. monopoly, monopsony, oligopoly, oligopsony, or conditions of monopolistic competition)
  - Market failures and externalities
  - Price discrimination and price skimming
  - Imperfect information (asymmetric information, transaction costs, principal–agent problems)
  - Taxes and tariffs
- But also (arguably much more subjective) questions regarding "social welfare":
  - one of the most typical topics: measurements of inequality and poverty
  - "social justice", equality or equity (egality), "the needs of the many outweigh the needs of the few" (see Star Trek: The Wrath of Khan (1982) :))

# "Special circumstances"

- "Laissez faire" might not be the best course of action at all times
  - the free market conditions might not be met (e.g. monopoly)
- There is no market
  - without property rights, no one can buy and sell
  - without buying and selling, there is no price
  - without a price, the market allocation does not work!
- The transaction costs prohibit the establishment of a market
- The laws prohibit the establishment of a market
- The government decided for a certain type of action
  - e.g. political promises in elections
  - concurrent policy intervention in a different area

# The trouble of welfare economics

- "The Invisible Hand" uses *objective* information, carried by price signals
- No one can gather and assess all the information in the market
  - government intervention needs to rely on the *estimates* of the *purely subjective* values
  - there is no way to compare the utility across individuals (utility is strictly *subjective*)
- Methods of natural sciences (such as an experiment - requires controlled environment and **replicability!**) not well suited for social sciences (empirical inductivism)

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# Externalities

- The typical efficient market outcome relies on the **existence of a market**
- There might be cases when the **market either does not exist** or when it is **not functional**
  - in such situations, the situation of the consumers and producers is **not driven by the market processes**
  - **without market processes** at work, it is **impossible** to attain the **efficient market outcome**
- Situations when the (property) rights of some of the market participants are affected by the actions of some other market participants, and these impacts are not compensated (the parties in question do not enter a market), are called *externalities*

# Existence of externalities

- The existence of an externality is typically labeled as "market failure" - a situation when markets fail to provide efficient outcome
  - More appropriate description would be market absence
- The impacts of the action on the "bystanders" can be positive or negative
  - In theory, a government intervention can improve the situation by either providing subventions (for the originator of positive externality) or levying taxes or fines (on the originator of negative externality)
- When considering the necessity of government intervention, it is often useful to employ the logical concept called "reductio ad absurdum" (one of the most famous users of this concept was political philosopher and economist Frederic Bastiat - you can <read his work for free>)
  - Take the presented argument and extend its application as far as possible - see if it still makes sense (a logical argument should hold)

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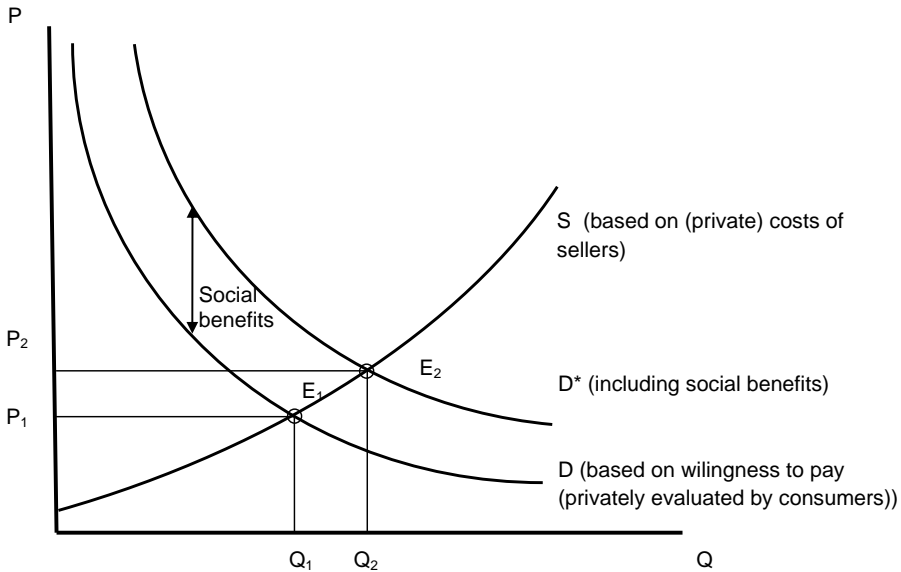
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# Positive externalities

- Rather rare and more disputable type!
- A typical examples include:
  - "public goods" (the operation of a lighthouse, public roads, education (lower crime rates, higher productivity))
  - the beekeeper and the owner of an orchard - the pollination by the bees is a necessity for a decent crop
  - you can consider even far stretched examples: persons enjoying the smell of a bakery next door or enjoying the sight of pretty girl walking down the street etc.

# Positive externalities

- Arguments in favor of the government intervention regarding a positive externality:
  - People do not consider the external benefits they might gain
  - The market quantity of the public roads, lighthouses, education or number of beekeepers will be too low
  - Solution: subsidize the costs of production of goods with positive externalities
- Counterarguments include the historical examples of privately funded "public goods" (e.g. lighthouses), or standard commercial practice of for-profit company regarding the typical case of "externality" (the pollination of orange plantations in California)
- Recall the fact the utility functions are strictly *individual* - subsidizing the generation of "positive externality" might not be efficient use of resources (costs vs. utility for the consumers)



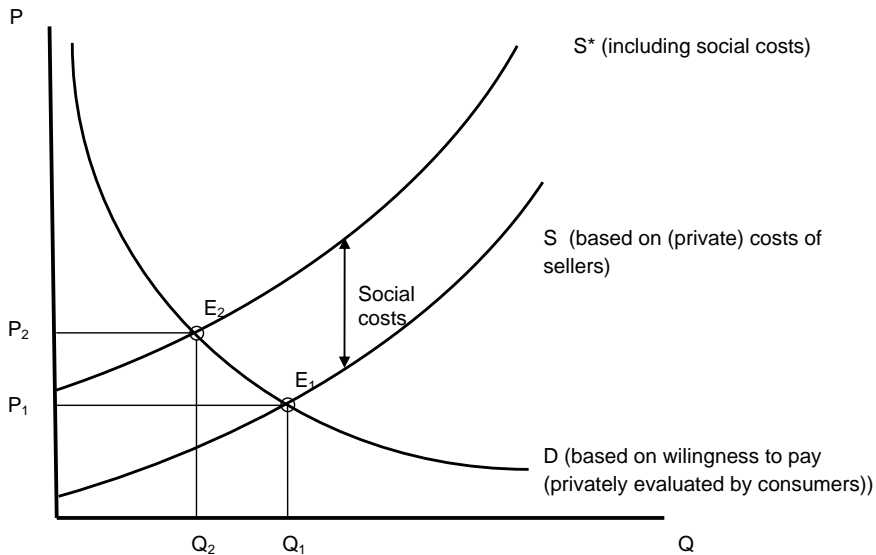
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# Negative externalities

- Typical example: pollution (e.g. from a private factory) deteriorating the environment in the vicinity of the factory
  - loud neighbors (or the so called "noise pollution" in general)
  - second-hand smoke
  - dislike of the smell of a bakery next door
- The argument for the government intervention:
  - To incur costs (the same amount as the social costs) on the market participants in order to change the outcome to socially optimal price and socially optimal quantity
    - These "corrective taxes" are so called Pigouvian taxes (after Arthur Pigou)





# Negative externalities

- Counterargument: what happens to the total surplus (recall  $TS = CS + PS$ )?
- Food for thought: pollution from the factory
  - 1 In the absence of the market intervention, people in the vicinity of the factory suffer loss (lower property value, health risks etc.) from the emissions in the size  $Em_1$ , assume the people in the vicinity placed a value on the loss  $L = l \cdot Em_1$
  - 2 Government levies taxes on the volume of pollution emissions
  - 3 Factory lowers (but not eliminates) its emissions,  $Em_2 < Em_1$  and pays taxes for this quantity of emissions  $T = t \cdot Em_2$
  - 4 Who was the beneficiary of the money ( $T$ ) paid for the given pollution? How much better off are the people in the vicinity of the factory? Is the new situation optimal for the people in the vicinity of the factory (did the intervention eliminated the uncompensated violation of their rights)?

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# Property rights

- The markets are able to find the optimal solution, if the information can be carried through - the market price provides this kind of information
- In order to create a price for something, it is necessary to establish property rights
- The non-existence or absence of the enforceability of the property rights leads to the failure to “internalize” externalities
  - Creating the environmental regulations and/or levying the taxes on the polluters might be as well viewed as a “license” to pollute (to violate the rights of the people in the vicinity)
  - The transaction costs between large number of participants may be high
  - Proving the damages or losses can be difficult.

# Private solutions to externalities

- Contracts can be made between market participants and the affected “bystanders” (e.g. accept a payment from the polluter to bear the damage, or pay the polluter to stop his production)
- People can create "moral codes" (self-regulation) or "social sanctions"
- *Coase Theorem*:
  - With the existence of property rights (i.e. if it is possible to trade) and there are negligible (or sufficiently low) transaction costs, private bargaining will lead to an efficient outcome regardless of the initial allocation of property rights.

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# Public goods

- Public goods are goods that have some special properties regarding their consumption
  - **Non-excludeability:** a person can not be prevented from using it (radio signals, national defense)
    - Usually only valid up to a certain limit (national defense can only do so much with a given budget etc., air might be limited (e.g. in space stations), even radio/TV broadcasts have limited range (limited power output))
  - **Non-rivality in consumption:** consumption of the good by one consumer does not prevent *simultaneous* consumption by other consumers (live music performance, radio signals)
    - Almost any tangible goods are rival in consumption
    - Most of the intellectual property is non-rival in consumption
- It is often possible to construct the means to convert non-rival goods to rival goods (licensing, IP rights, patents and copy protections, encrypted broadcasts etc.) - i.e. to create **club goods (excludable, not rival in consumption)** - consider e.g. free broadcast vs. encrypted broadcast satellite TV (DVB-S) (encryption creates **artificial scarcity**)

# Common goods (common property)

- Common goods are goods that are
  - **rival in consumption**
  - **not excludable**
- Common goods (in the pure fashion) imply open access regime: no limits on who is authorized to use a resource
- Examples:
  - fish stocks in the oceans
  - natural pathways (or public sidewalks)
  - "commons" (forests, rivers, arable land - with no specific owner, shared by all)
- Beware: common ownership  $\neq$  common goods
- Common ownership / Common property (unless considering the extreme case advocated by communism, and extending to formerly private goods) is usually limited to a certain group (often a town, a country)
  - there (typically) exists a legal right to exclude nonmembers of the group from using a resource.



# Tragedy of the commons

- The tragedy of the commons describes a situation when **overuse of common goods leads to depletion** of the common resource
- Already described in 1833 by W. F. Lloyd
  - a pamphlet on herders sharing a common parcel of land on which they are each entitled to let their cows graze
- Similar concepts of "inevitable" depletion of resources were described by Jevons (The Coal Question, 1865), Malthus (An Essay on the Principle of Population, 1798) and others
- Popular name coming from the article by G. Hardin (1968) "The Tragedy of the Commons"
  - described the individuals acting in rational self-interest will results overuse of the resources, overpopulation

# Government interventions

- For both public and common goods, **there is no** set market **price** for the goods
  - **Without a (market) price, the market processes can not work** properly
  - Non-existing price vs. desirable consumption → externalities
- Governments intervene in effort to raise the total welfare
  - Typical problem: free riders (see next slide)

# Free rider problem, public goods

- Free rider consumes the good (receives the utility) but does not pay for the goods
- If good is not excludable, there is an incentive to be a free rider (the supplier can not prevent the non-payers from the consumption)
  - since there are still costs of production, the good is either not produced at all or not produced in optimal quantity (even though there buyers might value the good higher than the costs of production → leading to the loss of welfare)
- Government solution: collect taxes from everyone and provide the goods for "free"
  - problem: everybody pays the taxes, but some might not value the provided goods as high as the amount of taxes (causing the loss of welfare)
  - comparing (aggregating) the welfare is impossible (utility functions are strictly individual, there is no universal "unit of value")

# Free rider problem, common goods

- The common goods (rival in consumption): government aims for restriction of the use of the common resources (as the free riders reduce the ability to use the resource)
  - corrective taxes ("internalize the externality")
  - set up a regulation for the use of the resource
  - auction off permits allowing use of the land ("cap and trade")
  - (divide and) privatize the resources (change it into private property)