

Session #9

Fundamentals of Microeconomics

Externalities and public goods

December 2, 2019

▶ Externalities

▶ Market distortion

▶ Property rights

▶ Common resources

▶ Public goods

POSITIVE AND NEGATIVE EXTERNALITIES ARISE AS SIDE-EFFECTS OF PRODUCTION AND CONSUMPTION

- ▶ An externality is created if someone's production or consumption hurts or benefits a bystander (an agent outside the market).
- ▶ If the bystander suffers a damage, we talk about negative externality.
 - ▶ Example of negative externality given by production: air pollution by a factory.
 - ▶ Example of negative externality given by consumption: air pollution by road traffic.
- ▶ If the bystander benefits, we talk about positive externality.
 - ▶ Example of positive externality given by production: bee-keeper and orchard.
 - ▶ Example of positive externality given by consumption: social networks.

STANDARD MARKET MECHANISMS CANNOT ENSURE OPTIMAL AMOUNT OF EXTERNALITY PRODUCED

- ▶ Externality represents a direct impact of production or consumption, which is not related to the price of the good exchanged in the market.
- ▶ If a producer of a negative externality is not penalized (e.g. financially), he produces too much of it.
- ▶ If a producer of a positive externality is not compensated, he produces too little of it.
- ▶ Issues related to externality creation often require government interventions, because they cannot be solved by standard market mechanisms.

NEGATIVE EXTERNALITY CAN ARISE FROM EXCESSIVE CONSUMPTION



- ▶ Between years 1984 and 2004, drivers in the US were massively switching from normal cars to SUVs.
- ▶ SUV is a very safe car for those who are driving it, which leads to overconfidence and higher speed.
- ▶ In case of accident, SUV is much more dangerous for other traffic participants.
- ▶ An increase of proportion of SUVs on the roads by 1% leads to increase of deadly accidents by 0.41%.

INCREASED DEMAND FOR A PARTICULAR TYPE OF GOOD CAN LEAD TO POSITIVE EXTERNALITY



- ▶ When in the season 1991/1992 Michael Jordan played for Chicago Bulls, revenues of the club increased, and so did revenues from tickets sold for away matches and from commercials during TV broadcasts.
- ▶ Total positive externality generated by Jordan for owners of other clubs and owners of broadcasting rights was estimated as 40 millions USD.

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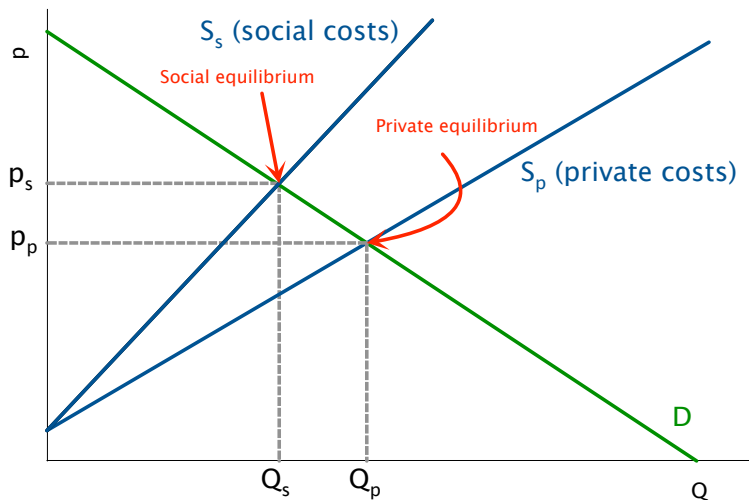
CREATION OF EXTERNALITIES IS GIVEN BY DIFFERENCE BETWEEN PRIVATE AND SOCIAL COSTS

- ▶ We will show why externality production is not optimally given by market mechanisms on the example of pollution.
- ▶ We will consider a paper factory that produces paper, but also pollutes the environment (air and water).
- ▶ The factory faces costs of production that do not include penalization for polluting - *private costs*.
- ▶ If we add to private costs also costs given by pollution, we get the *social costs*.
- ▶ Social costs are higher than private costs.

EQUILIBRIUM IN A COMPETITIVE MARKET DIFFERS FROM SOCIALLY OPTIMAL EQUILIBRIUM

- ▶ We will show that if the firm faces only private costs, it will produce an amount of externality that is too large from the point of view of the whole society.
- ▶ We will illustrate this issue on a supply and demand diagram.
- ▶ We know that supply in case when firm faces only private costs is larger than if it faced higher social costs.
- ▶ Supply given by private costs leads to private equilibrium (optimal for the firm).
- ▶ Supply given by social costs leads to private equilibrium (optimal for the society).

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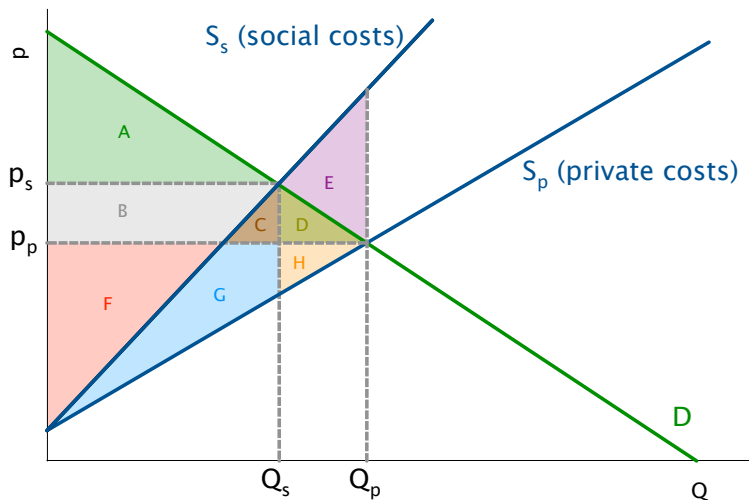
- ▶ In social equilibrium, the price is higher than in private equilibrium, because it reflects part of the costs of pollution.
- ▶ Higher price in social equilibrium leads to lower production and thus to lower pollution.
- ▶ From the point of view of the society, increase in price is compensated by decrease of pollution (which influences negatively society's welfare).
- ▶ Social equilibrium is thus better than private equilibrium in terms of welfare.

WE CAN REPRESENT THE ANALYSIS OF WELFARE GRAPHICALLY

- ▶ Consumer surplus is defined as area below demand and above price, up to the equilibrium quantity.
- ▶ Producer surplus is defined as area below price and above supply given by private costs, up to the equilibrium quantity
- ▶ Costs of pollution (CP) are defined as area between supply given by social and private costs, up to the equilibrium quantity .
- ▶ Society's welfare is

$$W=CS+PS-CP .$$

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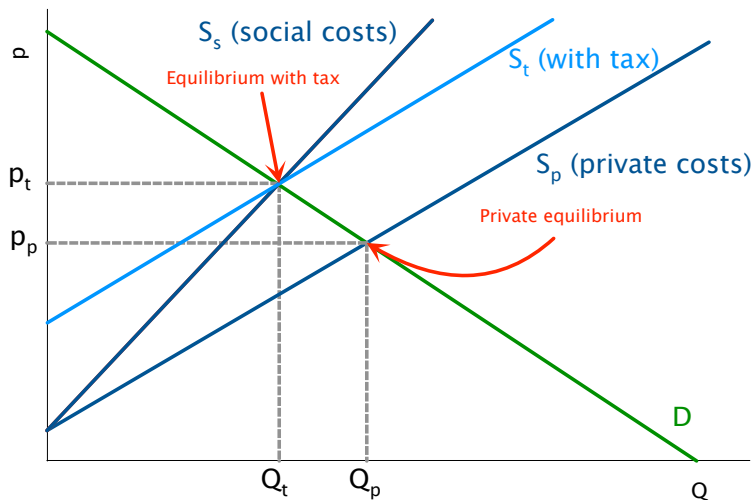
	Social equilibrium	Private equilibrium
CS	A	A+B+C+D
PS	B+C+F+G	F+G+H
CP	C+G	C+D+E+G+H
$W=CS+PS-CP$	A+B+F	A+B+F-E

- ▶ We can see that welfare in private equilibrium is decreased by deadweight loss of size of the area E.

PROBLEMS RELATED TO EXTERNALITIES CAN BE SOLVED BY GOVERNMENT INTERVENTIONS

- ▶ Since in private equilibrium, too much of negative externality is created, such situation requires usually government intervention.
- ▶ Government can set maximum amount of negative externality produced - in case of pollution the “emission standard”.
- ▶ Government can introduce tax on production of negative externality - in case of pollution “emission fee”.
- ▶ Further, government can control production of externality indirectly, for example through taxes on production and through quotas.
- ▶ Direct interventions are usually more efficient, because they motivate development of new production technologies that reduce negative externalities.

EXTERNALITY CREATION CAN BE LIMITED IF TAX ON PRODUCTION IS INTRODUCED



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EXTERNALITIES OFTEN ARISE AS CONSEQUENCE OF UNCLEAR DEFINITION OF PROPERTY RIGHTS

- ▶ In addition to quotas and taxes, government can reach social equilibrium by correct definition of property rights.
- ▶ In case of externalities, property rights are often not defined, since externality is usually related to public environment.
- ▶ If one of the two parties has property right, they can claim compensation, which internalizes the cost of externality and makes it subject to market mechanisms.

EXTERNALITIES CAN BE INTERNALIZED IF PROPERTY RIGHTS ARE CLEARLY DEFINED

- ▶ In the example of paper factory, people living near the factory can ask for compensation if their right to clear environment is defined. Factory will pay the compensation in this case, this will make the costs of production higher and factory will produce less.
- ▶ If, on the other hand, the factory has clearly defined right to produce freely and people living nearby desire to have clean environment, they can agree to pay a certain sum to the factory to reduce the production level.
- ▶ In both cases, optimal (lower) production of externality is achieved, but the costs are bore by different parties

EXTERNALITIES CAN BE INTERNALIZED IF PROPERTY RIGHTS ARE CLEARLY DEFINED

- ▶ Clear definition of property rights leads then to socially optimal solution that maximizes society's welfare.
- ▶ Optimal solution is conditioned by the possibility to negotiate to set the compensation for the two parties.
- ▶ Distribution of welfare between the two parties depends on the original definition of property rights.
- ▶ These claims are summarized by the Coase Theorem.

COASE THEOREM SAYS THAT CLEAR DEFINITION OF PROPERTY RIGHTS LEADS TO SOCIAL OPTIMUM

- ▶ According to the Coase Theorem, it holds that:
 - ▶ If there are no obstacles to negotiation, definition of property rights leads to efficient outcome that maximizes society's welfare.
 - ▶ This efficiency is achieved regardless on which party has the property right.
 - ▶ The exact definition of property rights determines the distribution of the welfare, since the party that has the property right has to be compensated by the opposite side.
- ▶ Practical application of this theorem encounters several problems:
 - ▶ Negotiation between all participants can be very difficult and costly.
 - ▶ Exact costs of the externality can be unknown.

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GOODS CAN BE CHARACTERIZED AS BEING OR NOT BEING RIVAL AND EXCLUDABLE

- ▶ We talk about rival goods if the use of the good by one person makes it impossible for other people to use the good as well.
- ▶ We talk about excludable goods when we can forbid somebody to use the good.
- ▶ According to these two characteristics, we recognize 4 groups:

	Excludable	Non-excludable
Rival	Private goods (chocolate)	Common resources (road)
Non-rival	Club goods (cable TV)	Public goods (national defense)

EXCESSIVE USE OF COMMON RESOURCES LEADS TO CREATION OF NEGATIVE EXTERNALITIES

- ▶ Common resources are non-excludable, but rival.
- ▶ It means that nobody can be forbidden to use these resources, but the more people use them, the more difficult it is for others to use them as well.
- ▶ Example: public parks, roads, internet, sea (fishing)....
- ▶ Since everybody takes into account only their private costs of using the resource and not total social costs, the use is excessive and negative externality is created.

Tailback in the USSR



Russia hour ... stranded motorists during a snowfall in Moscow last week
EPA

Monster two-day traffic jam paralyses Moscow motorway

THOUSANDS of lorries and cars were stuck in a monster 120 mile traffic jam between Moscow with Saint Petersburg – for more than two DAYS.

NEGATIVE EXTERNALITIES GIVEN BY USE OF COMMON RESOURCES CAN BE REGULATED

- ▶ Excessive use of common resources can be regulated by government interventions.
- ▶ Such use can be limited or subject to payment.
- ▶ Example: tolls, reserved parking spaces...
- ▶ Further, property rights on common resources can be defined and these can be thus privatized.

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NON-RIVAL PUBLIC GOODS LEAD TO CREATION OF POSITIVE EXTERNALITIES

- ▶ So far we have discussed mainly negative externalities and cases when their production or consumption was excessive, because it was not regulated enough by standard market mechanisms.
- ▶ Often, we can encounter also positive externalities - unfortunately, their production is below the optimal level, because their producers are not compensated enough.
- ▶ Public goods are an example of such positive externality.
- ▶ Public goods are non-excludable and non-rival.

IT IS DIFFICULT TO DECIDE WHO SHOULD FINANCE NON-EXCLUDABLE AND NON-RIVAL PUBLIC GOODS

- ▶ Since public goods are non-rival and non-excludable, when the good is produced, it can be used by an unlimited number of consumers.
- ▶ The crucial question is then who should finance the production of such good.
- ▶ If even those who do not pay for the public good cannot be forbidden to use it, we observe the *free rider* problem.

TO FINANCE OPTIMALLY POSITIVE EXTERNALITIES, FREE RIDER PROBLEM HAS TO BE SOLVED

- ▶ Free rider problem can be reduced by social pressure, merges, privatization or external regulations.
- ▶ If the number of users is limited, social pressure may make them contribute voluntarily.
- ▶ If the users are firms, they can merge and thus internalize positive externality.
- ▶ If the public good is privatized, it becomes excludable and free riders do not have access to it.
- ▶ Further, external interventions (often government regulations) may enforce contributions by all users of the public good (e.g. through taxes).

