Ing. Aleš KOCOUREK, Ph.D.

MICROECONOMICS
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5 Market Failure

In the current economic reality, a market failure represents a relatively usual situation when the market is not able to achieve a balance corresponding to the Pareto-efficient optimum nor is it approaching such a state. Market failures can have a number of causes:

⇒ microeconomic causes of market failures:

→ imperfect competition and existence of a natural monopoly on the markets of goods and services

→ imperfect competition on the markets of production factors

→ formation of externalities as supplementary, unintended effects

→ existence of public goods

→ asymmetrical information and a lack of information according to which producers and consumers would decide when allocating their sources and would achieve effective allocation

⇒ macroeconomic causes of market failures:

→ insufficient use of sources

→ insufficient use of human potential

⇒ non-economic causes of market failures:

→ efforts to limit the inequality of income distribution among economic entities towards which the market naturally heads (taxation, social benefits, charity)

→ need for increasing the quality of human potential (by means of education, enhancing qualification)

→ necessity to consider the quality of environment (laws, standards, ecological taxes, sanction fees for polluters)

5.1 Externalities

Externalities or spill-over effects mean unintended supplementary (external) costs or supplementary (external) utility for other entities which arise out of market transactions and that are not directly reflected in market prices. The externalities can occur in relation to consumption (consumption externalities) or in relation to production (production externalities).

5.1.1 Negative externalities

Negative externalities (external costs) occur if activities of one entity bring supplementary costs to another entity which are not directly reflected in the product price.

In such a case, **marginal social costs** (*MSC*) are the vertical sum of private marginal costs *MC* necessary for manufacturing the product and **external marginal costs** (*MEC*) defined as a change in the quantity of negative externalities caused by a change in the volume of produced output by one unit.

The equilibrium level of the production of goods is given by the equality of marginal social costs *MSC* and marginal social utility (*MSU*) of an additional unit of output which determines the demand D. The point $[Q_0;P_0]$ in the graph 5-1 represents the optimal output level at the optimal price.

However, the real output size of a product with a negative externality shall be Q_1 and the market price of the goods shall only be P_1. The reason of higher produced quantity is too low price P_1 which expresses only private costs of the firm spent on manufacturing the product. **Social inefficiency costs** are expressed as the difference of marginal social costs *MSC* and demand curve *D* for the output level in the interval between Q_0 and Q_1.
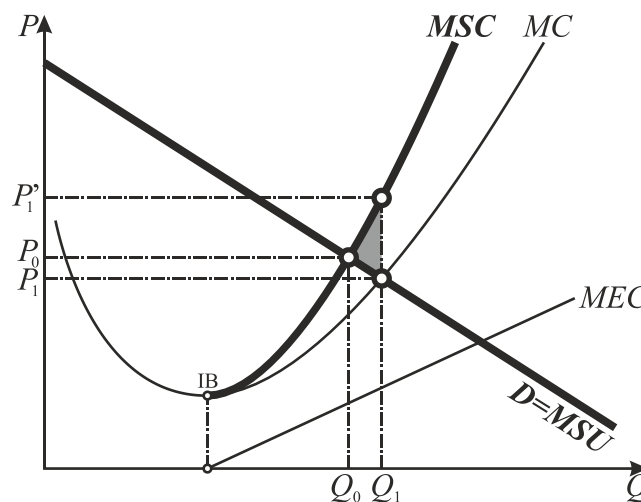
5-1 Negative externalities

Social inefficiency costs are graphically shown by means of the coloured part in the graph 5-1. In fact, we can declare that it is a relative economic loss (see also the page **Chyba! Záložka není definována.**), which is caused by the producer to economics by not considering the quantity of its external costs in its accounting.

The occurrence of a negative externality decreases the efficiency of markets. In case of social production and consumption efficiency, there is equality of **social marginal rate of product transformation** (*SMRPT*) and **marginal rate of product transformation** (*MRPT*) as well as equality of **social**

marginal rate of substitution in exchange (*SMRS_E*) and **marginal rate of substitution in exchange** (**MRS_E**):

$$SMRPT = MRPT$$
$$SMRS_E = MRS_E$$

<div align="right">(5.1)</div>

If a negative externality occurs, $SMRPT > SMRS_E$ shall be or:

$$SMRPT = \frac{MSC_A}{MC_B} \quad > \quad \frac{MC_A}{MC_B} = MRPT$$

<div align="right">(5.2)</div>

In such a case, the price system does not create conditions for optimal allocation of sources between the production of the goods A and the production of the goods B. The private sector shall tend to produce more goods with negative externalities to the detriment of the production of other goods.

5.1.2 Positive externalities

The equilibrium level of output of goods with positive externalities is given by equality of marginal costs *MC* and marginal social utility *MSU* of an additional output unit which is, in case of positive externalities, given by the sum of private marginal utility of the consumer *MU* (it determines demand *D*) and **marginal external utility** (**MEU**), which represents the amount of an additional positive externality caused by a change in the volume of produced output by one unit. The marginal external utility can be considered as an effect which is gained by another consumer without paying for it to its provider.

The intersection point of marginal cost and marginal social utility curves, the point $[Q_0; P_0]$ in the graph 5-2, represents the optimal output level at the optimal price. However, the real output size of a product with a positive externality shall be Q_1 and the market price of the goods shall be P_1. The reason for lower produced quantity is too low price P_1, which reflects only marginal utility of the consumer *MU* but does not include external marginal utility which is gained by other (further) consumers. **Social inefficiency costs** are expressed as the difference of marginal social costs *MSU* and marginal costs for the output level in the interval from Q_1 to Q_0.
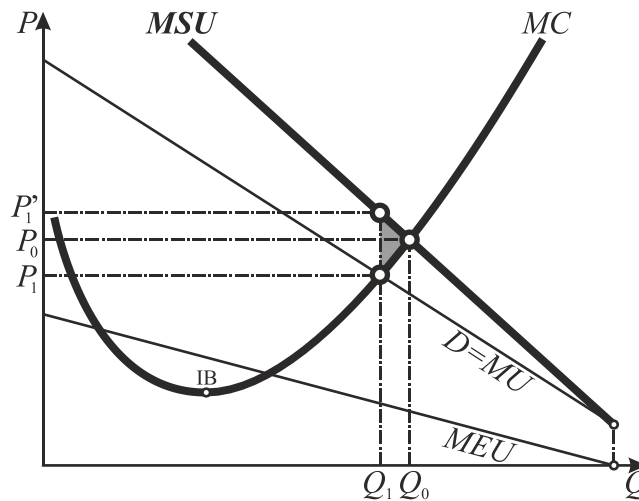
5-2 Positive externalities

Social inefficiency costs are graphically shown by means of the coloured part in the graph 5-2. Basically, we can say that it concerns lost opportunity costs (see also the page **Chyba! Záložka není definována.**), which are caused by the positive externality producer to the economics by not considering the quantity of real social utility in its price.

The occurrence of positive externalities decreases the efficiency of markets. In case of social production-consumption efficiency, there is equality of **social marginal rate of substitution in consumption** (*SMRS$_C$*) and **marginal rate of substitution in consumption** (*MRS$_C$*) as well as equality of **social marginal rate of substitution in exchange** (*SMRS$_E$*) and **marginal rate of substitution in exchange** (*MRS$_E$*):

$$SMRS_C = MRS_C$$
$$SMRS_E = MRS_E$$

(5.3)

If a positive externality occurs, $SMRS_C > SMRS_E$ shall be or:

$$SMRS_C = \frac{MSU_A}{MU_B} \quad > \quad \frac{MU_A}{MU_B} = MRS_C$$

(5.4)

In such a case, the price system does not create conditions for optimal allocation of output among consumers. The private sector shall tend to produce fewer goods with positive externalities in favour of production of other goods.

5.1.3 Methods for solving externalities

The elimination of externalities (mainly negative externalities) is one of tasks in case of state interventions in the market environment. The basic measure for eliminating negative externalities is a ban on production which brings negative externalities. Another possibility is to decrease negative externalities by means of standards and restrictions the breaking of which can be sanctioned by the state. The negative externality production can be further penalized by the state in the form of taxation of negative externalities, by imposing so called a Pigovian tax by which the production of goods associated with negative externalities shall also be decreased.

$\Rightarrow$ government interventions

$\rightarrow$ legal constraints of those activities which cause negative externalities

$\rightarrow$ penalties and fees (ecological tax, Pigovian tax – see below)

$\rightarrow$ subsidies with limiting negative externalities

$\Rightarrow$ government interventions with the use of market mechanisms

$\rightarrow$ tradeable emission permits

$\Rightarrow$ market solution

$\rightarrow$ internalization of externalities by increasing economic units (theory of a single owner)

$\rightarrow$ social sanction

$\rightarrow$ theory of ownership rights (Coase theorem)

5.1.3.1 Pigovian tax

A Pigovian tax is the indication for taxation of unfavourable impacts on the environment (or compensation for positive externalities). Its purpose is to "internalize" these externalities, i.e. to transpose their impact into decisions of their originators with the requirement of social efficiency. It is named after **Arthur Cecil Pigou** (1877-1959), an English economist, who introduced the term of externalities and whose main contribution is development of welfare economics. Pigou pointed out to a shortcoming of the market system which optimally allocates sources but need not ensure the maximum social welfare. He then defined social welfare as the summation of the welfare of all individuals. This welfare is maximized if the welfare of one individual cannot be increased without decreasing the welfare of the other individual. Although Pigou was a supporter of liberalism, he defended the need of state interventions when solving externalities. On the side of positive externalities, the state can motivate producers to increase their produced output by means of subsidies. The Pigovian approach is primarily based on state regulations of market failures which decreases inefficiency to a certain extent, however,

it does not eliminate it in any case.

5.1.3.2 Coase theorem

The Coase theorem states that each externality can be eliminated regardless the entity that shall be finally compensated. The Coase solution consists in the fact that participants of the problem are left to agree on an effective solution, i.e. the producer and recipient of externalities shall mutually and without transaction costs agree on the mutually acceptable quantity of produced externalities and on financial compensation of the responsible party to the counter-party. This theory was first published by **Ronald Coase** (1910), an American economist, in the article *"The Problem of Social Cost"* in October 1960. However, his theoretical consideration has two conditions under which it is applied:

⇒ The first condition consists in **precisely defined ownership rights** since if it is not clear who is responsible for damage, no agreement between individual parties can be made. Nobody would manage to start negotiation. If the rights are precisely defined, then, in Coase's opinion, it is not important on whose side the right is. The ownership rights only determine who shall pay to whom for achieving efficient results.

⇒ The second condition consists in **zero transaction costs**. This term was introduced by Coase in the article *"Nature of the Firm"* in 1937. It is a purely theoretical assumption, unreachable in practice, however, this condition is essential and cannot be avoided when applying the Coase theorem. **Transaction costs** are costs associated with negotiating and implementing contracts. They represent time, work and other sources spent on concluding and controlling contracts. These are costs associated with the application of price mechanism – people must look for prices, compare them, draw up contracts, control them, create solution mechanisms for conflicts (apply sanctions in case of non-fulfilment). **Information costs** (costs of information acquisition) and **managerial costs** are a part of transaction costs. Managerial costs are defined if the producer and recipient of externalities are one subject, external costs then become internal costs. The transaction costs can be decreased by correctly specified institutions (rules).

In case of **non-zero transaction costs**, for using the Coase theorem, it is necessary to know the amount of transaction costs of negotiation before its starting. This amount of transaction costs is then compared to damage caused by externalities and based on this difference, there is (negotiation price is lower than negotiation returns) or is not negotiation (negotiation is too expensive and it would not bring results sufficient for covering transaction costs).

5.2 Public goods

With respect to the decision-making procedure regarding goods (i.e. how it is decided on production, consumption of goods and allocation of financial funds), economic goods can be divided into:

⇒ **private goods** (market, personal) on the production of which producers striving for achieving maximum economic profit decide and on the consumption of which households decide individually according to their needs (or according to utility which is brought to them by consuming these goods) with regard to market prices and with regard to their budget constraints. At the same time, we suppose that rational consumers try to maximize their consumer surplus.

⇒ **public goods** (non-market, publicly provided) the production and consumption of which are decided by public choice within the community given. Consumers do not gain them by means of the market, i.e. there is no free exchange between the producer and consumer. Therefore, the public goods do not have market prices since the state or some lower degrees of state administration or self-administration decide on their production and conditions for their provision. The primary purpose of the production of public goods is not usually economic profit maximization.

The first who defined the term "**public good**" was **Paul Anthony Samuelson** (1915-2009), an American professor, in the article *"The Pure Theory of Public Expenditure"* in 1954. In Samuelson's opinion, these are goods from which all consumers have common utility in the sense that the consumption of these goods by any individual does not cause any restriction to any possible consumption by other economic entities. Contrary to the private goods, the public goods are typical for nonexcludability from consumption and nonrivalry in consumption:

⇒ **Non-excludability** from consumption is a feature of the good when it is practically impossible to eliminate individuals who do not pay for the consumption of this good from the consumption of the goods.

⇒ **Non-rivalry** (non-competitiveness) is a feature of the good when the consumption of public goods by one economic entity does not have any impact on the quantity of the goods which can be consumed by other consumers.

An example of public goods can be public lighting, state defence, general education, safety of population and others.

Collective goods are mixed goods which show rivalry in consumption, however, it is difficult or

impossible to eliminate them. In this case, a good example can be freely accessible sources (e. g. forest wood) or general health care. An opposite example is represented by mixed goods characterised by non-rivalry in consumption, however in fact, elimination from consumption is possible here. If there is non-rivalry for a certain type of the goods, however, its excludability can be reached, it can be described as so called **club goods**. An example of the club goods can be coded television signal broadcasting or using a golf playground for golf club members and others.

The non-excludability and non-rivalry can lead to the individual's tendency to consume public goods without paying for this consumption with the idea that costs of public goods shall be paid by another subject and with the certainty that they cannot be eliminated from the consumption of the goods. This situation can be described as the position of "**stowaway**". The only solution of this problem is to ensure that each consumer of the public goods would pay for it. There must be a method by means of which the consumer is enforced to pay for public goods. The payment for public goods is realized by the state e. g. by means of taxes, by local authorities by means of fees, in specific cases, individuals can be eliminated from consumption of public goods and penalized.

non-rivalry	mixed goods (club goods)	pure public goods
rivalry	pure private goods	mixed goods (collective goods)
	excludable	non-excludable

*(left axis label: **non-rivalry of consumption**)*

non-excludability from consumption
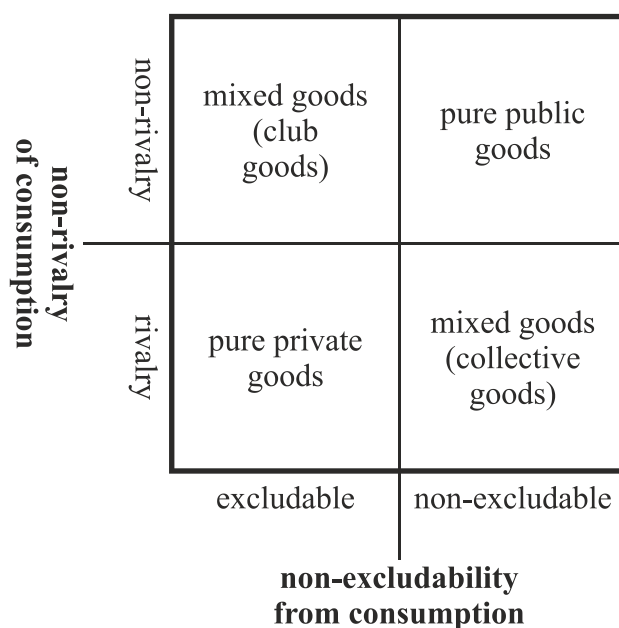
5-3 Private and public goods according to Samuelson

Joseph Eugene Stiglitz (1943) is an American economist and recipient of the 2001 Nobel Memorial Prize in Economic Sciences. Stiglitz is most commonly included in the economic school of so called "new Keynesians" following the economic theory and conclusions of John Maynard Keynes. Keynes promoted state interventions in economics, especially by means of fiscal incentives. Stiglitz enriched his thoughts by the belief that targeted state interventions in economics bring more efficient results in a number of areas compared to the results which would be achieved by the free play of unregulated market mechanisms. The classification of goods was published by Stiglitz in the book *"Economics of*
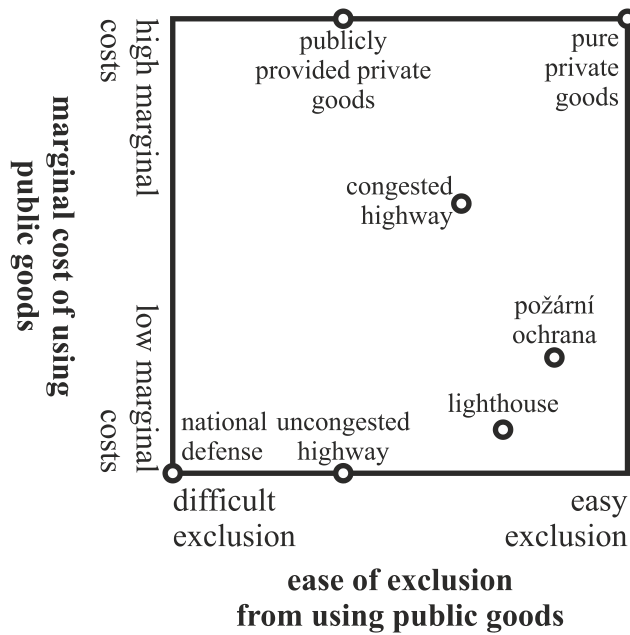
5-4 Private and public goods according to Stiglitz

5.2.1 Comparing the market demand for public and private goods

The market demand **for private goods** is given by the horizontal sum of individual demand curves (see also the page 30), which express marginal utility of individual consumers for each price level of private goods (see the graph 5-5). In fact, it can be said that the market demand for private goods expresses the total demanded quantity of all consumers on the market in dependence on the price.

Market demand for private goods is constituted as a **horizontal** sum of individual demands.
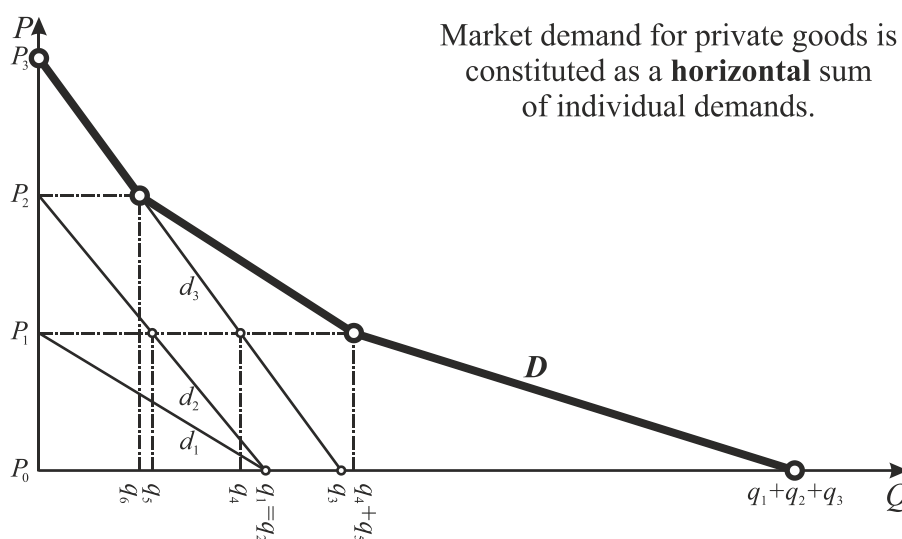
5-5 Market demand for private goods

Then, the market demanded quantity can be written as follows:

$$Q = \sum_{i=1}^{n} q_i \,, \tag{5.5}$$

where Q is the total demanded quantity of private goods and q_i is the individual quantity of private goods demanded by the ith of the total number n of consumers.

The willingness-to-pay curve (market demand for public goods) is given by the vertical sum of individual demand curves which express marginal utility of individual consumers for each level of consumption of public goods (see the graph 5-6). The total demanded or consumed quantity of public goods is still the same (since public goods are characteristic by their nonrivalry):

$$G = q_{G1} = \ldots q_{Gi} \ldots = q_{Gn} \,, \tag{5.6}$$

where G is the total consumed quantity of the public good G, q_{Gi} is individual consumed quantity of the public good G by the ith of the total number n of consumers.

Due to this fact, the market demand for public goods or the curve of willingness to pay for public goods is the vertical sum of individual demand curves since in the case of public goods, it is not about specifying the total demanded quantity at the given price (as in case of private goods) but rather about the amount which all consumers would be willing to pay together for the given quantity of public goods.
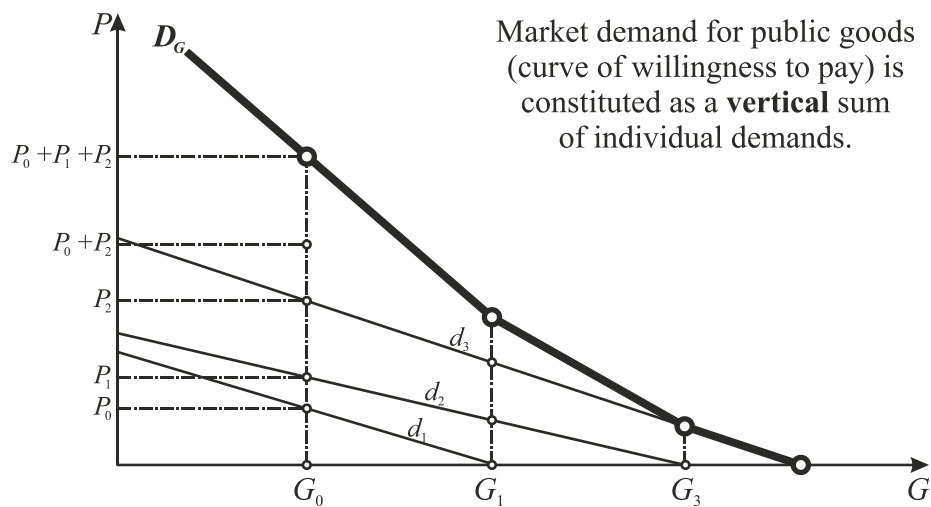
5-6 Curve of willingness to pay for public goods

5.2.2 Optimum quantity of provided public goods

The optimum quality of provided public goods is determined by an intersection point of market demand for public goods and marginal costs of production of public goods. The equilibrium on the market of public goods E_0 is reached if the total monetary amount, which the consumers are willing to pay for an additional unit of public goods, is equal to marginal costs necessary for production of this additional unit of public goods and at the same time, if the total costs of acquisition of public goods do not exceed

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the amount which the consumers are willing to pay for the total quantity of public goods given. Simply said, we can consider the MC curve as the curve of supply of public goods (for more detailed analysis compare with the chapter 3.1.1, especially on the page 74).
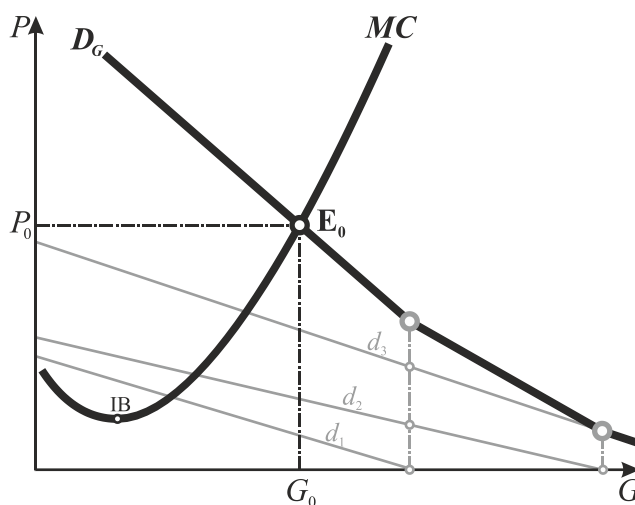
5-7 Optimal quantity of public goods

The production and consumption of public goods decrease the efficiency of markets. In case of social production-consumption efficiency, the equality **of social marginal rate of product transformation** ($SMRPT_{(G/Q)}$) and **social marginal rate of substitution in consumption** ($SMRS_{C(G/Q)}$) is applied.

$$SMRPT_{(G/Q)} = SMRS_{C(G/Q)} \tag{5.7}$$

$$SMRS_C = \frac{MSU_G}{MU_{Qi}} = \frac{MU_{G1}}{MU_{Qi}} + \frac{MU_{G2}}{MU_{Qi}} \tag{5.8}$$

Since the public goods bring benefits to all consumers whereas the private goods increase the utility only to the consumer who buys them, disequilibrium shall be applied:

$$SMRPT_{(G/Q)} = MRS_{C(G/Q)} \tag{5.9}$$

$$\frac{MU_{Gi}}{MU_{Qi}} < SMRS_{C(G/Q)} \tag{5.10}$$

The conditions of efficiency cannot be reached by the impact of price system, and therefore, the market tends to allocate a lower amount of sources into the production of public goods in favour of the production of private goods. In case of private as well as public provision of public goods, the Lindahl mechanism can be used to ensure efficient allocation of public goods.

5.2.2.1 Lindahl mechanism

The Lindahl mechanism supposes the possibility of applying the first-degree price discrimination (see the chapter 3.2.1.2 on the page 89). With the knowledge of optimal quantity of public goods, individual prices of public goods for each of consumers can be derived with which efficient allocation of public goods is ensured. If the goods are provided by the state, prices of public goods are replaced by individual tax rates for individual consumers. Ideally, each consumer should pay a contribution fee which would correspond to his marginal utility in consumption. Such a hypothetical price is called an individualized or tax or Lindahl's price.

Erik Lindahl (1891-1960) was a Swedish economist and student of Knut Wicksell (1851-1926) whose work was inspired e. g. by the above-mentioned John Maynard Keynese. In his model, Lindahl tried to simulate the market mechanism functioning as much as possible. The market equilibrium of private goods is determined by an intersection point of the demand and supply curve. All consumers pay the same price and the sum of all individual demands is equal to the sum of outputs of all firms. One of the methods with which the efficient level of public consumption was determined was specifying the intersection point of the aggregate demand and supply curve. On the graph 5-8, it means that e. g. the consumer 1 (d_1) would accept the quantity G_0 at the price of public goods $p1$ (or if you like, the fee or tax amount) while the consumer 2 (d_2) would be willing to pay the price p_2 for the same quantity G_0 and the consumer 3 (d_3) even p_3. The equilibrium point in the Lindahl model is the intersection point of demand and supply (or MC curve), i.e. the point E_0.d. It is evidently efficient allocation (equality of supply and demand), however, individuals gain the same level of public goods for various prices. The equilibrium point is characterized by the level of public consumption G_0, the first consumer pays the price p_1, the second one p_2 and the third consumer the price p_3.
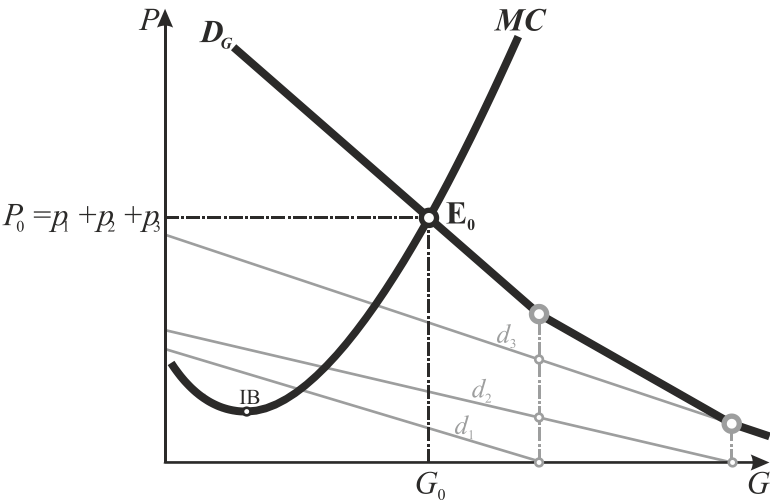
5-8 Lindahl mechanism

A weakness of the model is that the consumer considers the price of public goods as given and

independent of his choice. If they understand the mechanism of the Lindahl model, they shall understand that their choice has an impact on the amount of taxes, and therefore, they shall not be interested in true expression of preferences.

5.2.2.2 Groves-Clarke mechanism

The Groves-Clarke mechanism ensuring the efficient allocation of public goods makes consumers truly express their preferences. Thanks to the Groves-Clarke mechanism, public goods are provided only if the allocation efficiency of public goods on the market is ensured which leads to the non-efficient allocation of public and private goods altogether (for details see the reference to the articles of Edward H. Clarke and Theodor Grove and Martin Loebe in the recommended literature list on the page 180).

5.3 Asymmetrical information

Asymmetrical information is another cause of a market mechanism failure when allocating sources. We perceive information as asymmetrical if on one side (on the side of a demanding entity or on the side of a supplying entity), there is more complete information while on the side of the second business transaction subject, information is incomplete. Information can be related to the product quality, competitive environment, functioning of the firm and others. The asymmetrical information is formed as a result of **secret activities** (activities which cannot be noticeable by other subjects precisely and without any additional costs) or **secret information** (in the case when one side on the market has more professional information compared to the other one).

5.3.1 Moral hazard

Moral hazard is specified as an activity of one economic entity (better informed) which maximizes its utility by decreasing the utility of other (less informed) transaction participants. A typical example of moral hazard is so called a delegation problem or the relation agent-principal.

A principal is a person who hires an agent to perform activities which directly influence the size of principal's utility. An example can be the firm's owner and manager, patient and doctor, insurance company and insurant, restaurant or bar owner or operator or others. The principal as well as the agent are motivated by their own interests, they both try to maximize their utility but their interests are not identical. Most of all, the bar owner wants to maximize profit, i.e. first of all to pay all operational costs and make some extra money. Naturally, the operating manager of his bar wants to maximize his utility, i.e. to earn the maximum amount possible in addition to his wage, usually regardless the legality of these auxiliary activities and regardless the owner's interests.

If the principal wants to motivate the agent to enforce his (principal's) interests, he can use e. g. **participation** in the principal's utility (the agent tries to maximize both his own utility and principal's utility) or by means of additional **monitoring** of agent's activities (which can be associated with considerable costs though).

Thus, as a general rule, the delegation problem solution consists in allocating revenues from economic activities between the principal and agent whereas the selection of remuneration system is very important since it is a tool by means of which the principal can ensure the compatibility of his own and agent's objective. By monitoring the agent's activities, the principal can further restrict an unfavourable impact of asymmetrical information.
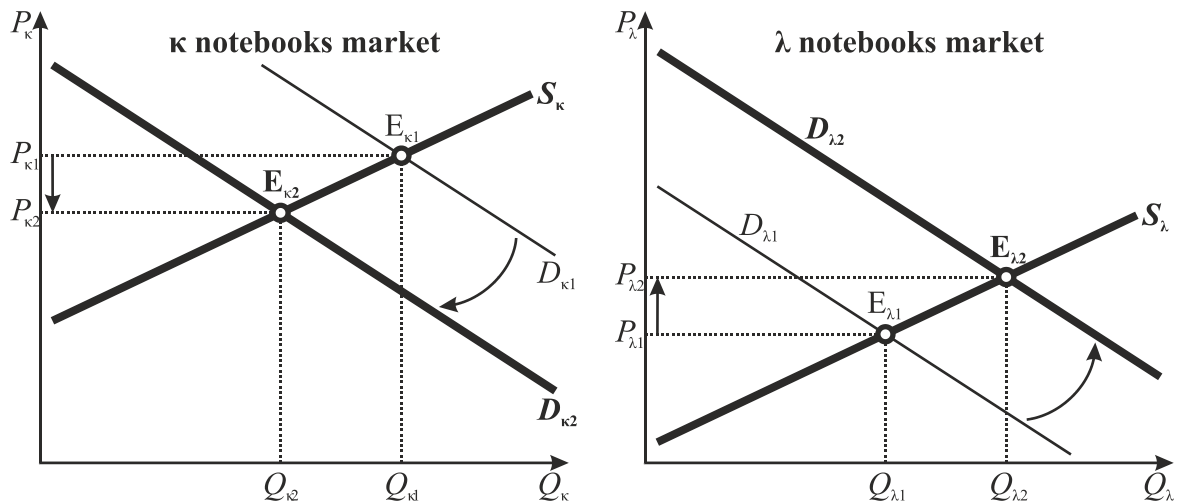
5.3.2 Adverse selection

Adverse selection is a situation on the market when asymmetrical information regarding the quality of goods results in displacing more superior goods by less superior goods. In case of perfect information, the consumers would be able to select between less superior, cheaper products and more superior products with higher market prices. In case of asymmetrical information (when sellers possess of more complete information about products and buyers dispose of incomplete information), so called "**Old Maid market**" is developing.

An example can be the market with highly superior notebooks Kappa (**κ)** and less superior notebooks Lambda (**λ)**. Due to asymmetrical information, the consumer is not able to distinguish the quality of both brands and it leads to deteriorating the idea about average quality of notebooks.

$\Rightarrow$ On the market with superior notebooks **κ**, there shall be a decrease in demand (the consumer is not able to appreciate the quality of goods and shall replace the goods by relatively cheaper and less superior goods), which shall result in a decrease in the price (from $P_{\kappa 1}$ to $P_{\kappa 2}$) and a decrease in the realized quantity of highly superior goods on the market (from $Q_{\kappa 1}$ to $Q_{\kappa 2}$).

$\Rightarrow$ On the market with less superior notebooks λ, the demand shall increase which shall subsequently lead to increasing the price (from $P_{\lambda 1}$ to $P_{\lambda 2}$) as well as realized quantity of less superior goods on the market (from $Q_{\lambda 1}$ to $Q_{\lambda 2}$).

The resulting effect shall be displacing a certain quantity of superior goods by less superior goods and decreasing price differences between highly superior and less superior products.

5-9 Adverse selection on the market with notebooks

The problem of asymmetrical information arises if one side disposes of any information advantage on the market and the other party of any information disadvantage and needs other information which would increase the efficiency of its deciding while enabling the achievement of higher efficiency when allocating the goods.

Signalling behaviour is the effort of the side with any information advantage to provide the side with any information disadvantage with information while changing its behaviour and position on the market. The acquisition of this information brings additional costs and some information can be absolutely inaccessible for the consumer or producer. Free distribution of the highest volume of information possible is therefore one of possibilities how to ensure more efficient competitive environment.

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