

## Economic Instruments for Environment Protection and their Implication for Firms

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**Abstract:** *Economic instruments are used in order to attain sustainable development. The paper describes the main types of economic instruments used and their role to induce a change in behaviour of economic agents by internalising environmental or depletion cost. The paper also presents economic instruments used in Romania and some of their effects.*

Any economic activity starts and ends with the environment. Thus, economic agents benefit from resources, such as air, water, natural resources used as staples that they modify and allocate either for consumption, or for the production of intermediate and final goods. After the economic activities, the resources come back in nature as waste products and impurities. Moreover, the economic activity needs areas where it can develop, as well as an adequate infrastructure, which leads most of the times to more emphasized environmental damage.

The interdependence between the economic activity and the environment is represented in fig. 1.

The economic activities generate pressure on the environment:

- through the demand of staples, energy, intermediate goods (reflected by arrow 1) or through the demand of final goods (reflected by arrow 2),
- through the flow of the impurities and of the waste products resulted after the production (arrow 6) or consumption (arrow 7),
- through the occupation of natural areas by roads, buildings, halls, warehouses.

The natural environment, as relaxation frame, is used in the development of the productive activities like tourism (arrow 3) or, through natural beauties, it satisfies the consumer (arrow 4). There are also situations when there is a sort of interdependence between production and consumption when the production of an economic agent influences both the population's consumption and the production of other economic agents (arrow 5).

These pressures are in a certain amount attenuated through systems and absorption mechanisms, such as the assimilation of the waste products or the absorption of pollution (arrows 8 and 10), but also through the regeneration of the environment. But the capacity of the environment of assimilating the waste products and the impurities is limited, under the circumstances of the level of the technological knowledge we have got to know today. Consequently, when the pressure is bigger than the capacity of absorption, they cause environmental changes, leading to environmental damage.

Nevertheless, environmental damage implies welfare losses for a part of the community members, and for these losses, caused by the producers' and consumers' actions, the ones that caused them do not pay any compensation.

The economic theory defined these situations as externalities. Thus, by „externality” we mean the gains or the losses imposed by an economic agent through his/her activity to other economic agents without compensating the imposed losses or without benefiting from the extra gains generated to the others through his/her activity.

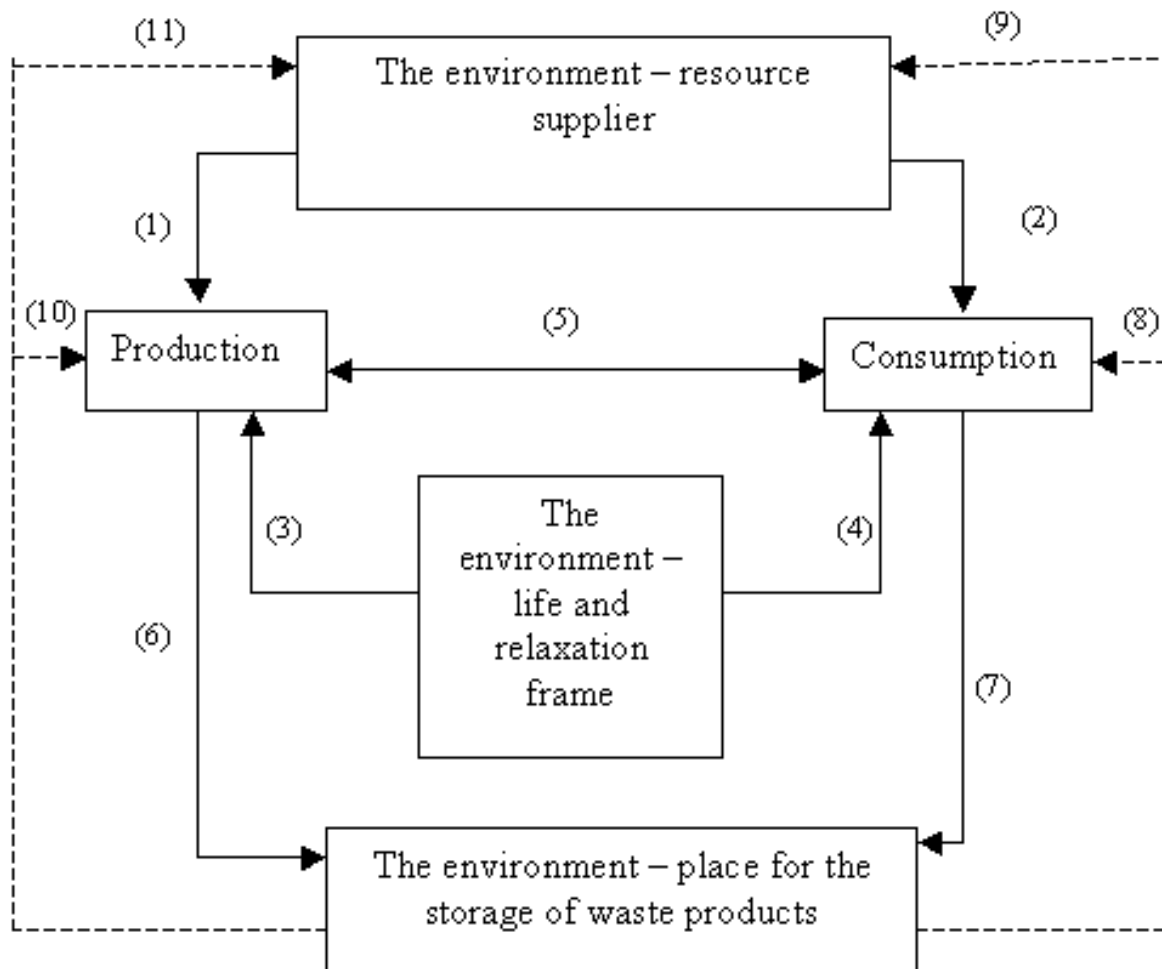


Fig. 1 – The relationship between the economic activity and the environment

(Source: adaptation after Ph. Hardwick, J. Longmead, B. Khan, *Introducere în economia politică modernă*, Editura Polirom, Iași, 2002)

Externalities are different according to:

- the stage of the process of economic reproduction in which it manifests itself;
- the meaning of the results imposed to the third parties;
- the way their effect is reflected.

From the point of view of the stage of the economic reproduction, we can distinguish:

1) externality of consumption, which appears when the consumption of an economic agent is directly influenced by the production or the consumption of another economic agent.

The expression of such an externality in an economy with two persons and two goods, is as follows:

$$U_A = f(a_1, a_2, \dots, a_n; b), \quad (1)$$

Where  $U_A$  represents the total use of the person, A,  $a_1, a_2, \dots, a_n$  represent the activities under the direct control of A, and  $b$  represents the activity of the person B. This way, we notice that the use of the person A does not depend only on his/her own activities, but also on the ones of B.

2) externality of production, that appear when production possibilities are influenced by the choices of another factory or consumer.

The externality of production can be expressed as follows:

$$P_F = f(f_1, f_2, \dots, f_n; d), \quad (2)$$

where  $P_F$  expresses the profit of the firm F, that depends on the firm's own activities  $f_1, f_2, \dots, f_n$ , but also on the activity of another firm or of a consumer. Thus, we notice that the losses or the gains imposed by the activity of the tertiary are not compensated or paid to him/her.

From the point of view of the meaning of their results, externalities are classified as:

- a) positive, when they are generated by activities that bring benefits to other economic agents than the ones that generated them;
- b) negative, when they generate unpleasant situations for the consumers and economic agents that are inevitably in contact with the economic agent that created them.

The existence of the positive externality has as a result the appearance of a difference between the social benefit (higher) and the private benefit (lower), difference known in economic theory as external benefit. On the other hand, as a consequence of the negative externalities, there is a difference between social costs (higher) and private costs (lower) that is reflected in what economic theory calls „external cost”.

The problem that gained most of attention concerning negative externalities is represented by pollution, which through its force and complexity can have devastating effects.

According to the way of reflecting their effects, externalities are grouped in:

- a) technical externalities;
- b) pecuniary externalities.

As it was previously stated, externality represent a way of failure of the markets, this meaning the lack of reflection at the level of the price of the market of one of the costs or benefits associated to production or consumption. They show up and manifest themselves when the social costs and benefits are different from the private ones and lead to a state of economic inefficiency if the social marginal cost of the production isn't equal to the price of the market.

Environmental damage produced through the economic activity is one of the most important negative externality. In this case, private costs, paid by the economic agent that caused the damage, are more reduced than the social costs. The latter include, besides private costs, external costs, as well. Other people pay these costs and the polluter does not compensate them.

Such a situation leads to the inefficiency of the allocation of the resources.

In order to explain this, we will use the graphic representation:

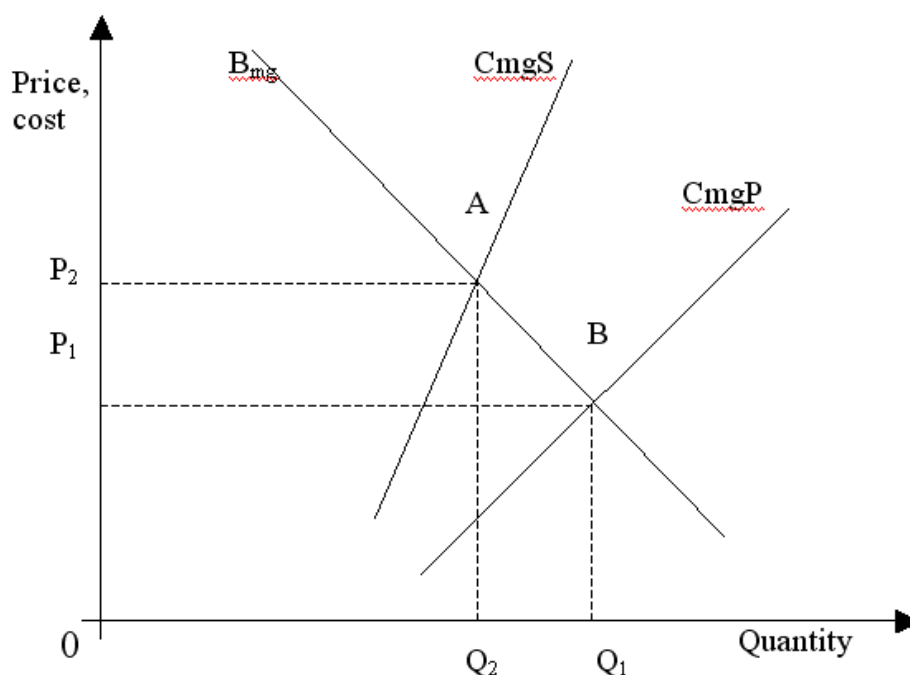


Fig. 2 – The inefficiency caused by negative externalities

Let's take the case of a factory that develops activities with a pollution effect (for example, a factory that spreads CO<sub>2</sub> in the atmosphere). Part of this damages the factory because it generated the necessity of repeated painting and the employees' increase of expenses with medical assistance. But most of the damage (the way the vegetation and the buildings are affected, the growth of the respiratory diseases when it comes to population) is external to the firm, being spread at the level of the area in which the firm works, being put up with by the affected population or by the local firms or communities.

Consequently, the private marginal cost, handled by the producing firm, is lower than the social marginal cost, which includes external costs as well, caused by pollution.

From the social point of view, the balance that corresponds to an efficient allocation of the resources is at the intersection between the marginal benefit (Bmg) and the social marginal cost (CmgS), namely at a production level equal to Q2. But the objective of the firm is the one of maximizing the profit, which, under the circumstances in which it takes into consideration only the private marginal cost, will cause an equal production to Q1.

Thus, we notice that the quantity that maximizes the profit of the firm (Q1) exceeds the efficient quantity from the social point of view (Q2), which emphasizes the fact that at the production level Q1 (with a price P1) the consumers of the good obtained in pollution conditions are subsidized by the ones that deal with the pollution costs.

The solution of the environmental externality implies the state's intervention.

The ways of intervening of the state carries at least two stages, namely:

a) the government establishes objectives for the quality of the environment that can be expressed under the form of the wanted level for the quality of the air or of the water, of an annual level of transmission of the toxic substances or other norms;

b) the government is looking for the best measures in order to accomplish the established objectives.

The different used methods for the accomplishment of the objectives aim at making external effects internal, namely the ones that produced them have to put up with them. When these measures need to be taken, we start from the fact that the failures of the market are materialized in an overproduction of the goods with negative externalities and, respectively, a reduced production of the goods with positive externalities. Thus, governmental politics of allocating external effects efficiently has to realize in the case of the goods with negative external effects a reduction of the produced quantity and the diminishing of the negative effects by the fact that the producers have to put up with them, and in the case of the goods with positive effects a stimulation of their development.

Concerning the state's intervention in order to solve the problem of the externality, they have come up with different solutions, different methods through which they can get to the best result.

The suggested measures can be classified in two categories:

a) *the public settlement*, that is used for the externalities that affect the people's health and safety, and for which the most often encountered form is the one of standards. The elaboration of the best settlements is a difficult task that needs complex scientific studies, being at the same time the target of some political pressures. We also find in the same category the *prohibition* or *constraint* measures, which imply the interdiction of the activities generating negative externalities (total prohibition, most of the time impossible) or the constraint of some administrative limits of the activity in certain fields (partial prohibition).

b) *the economic instruments*, that aim at changing the behavior of the one that pollutes the air through the changes of the cost and of the advantages that come from its decisions.

Economic instruments are fiscal and other economic incentives and disincentives to

incorporate environmental costs and benefits into the budgets of households and enterprises<sup>1</sup>. Economic instruments include effluent taxes or charges on pollutants and waste, deposit—refund systems and tradable pollution permits.

Economists have promoted the use of economic instruments as environmental policy measures for long time. The major advantage of economic instruments is, in theory, that they incorporate environmental concerns directly into the market price mechanism of the market economy. Therefore, these instruments have all the efficiency properties of the competitive market pricing<sup>2</sup>. By using these, firms are encouraged to develop a sound and efficient environmentally production and consumption through full-cost pricing.

One of the most important economic instruments in use today is taxes and charges.

A commonly used classification of taxes and charges distinguishes between three types, based on their function in public/environmental policy<sup>3</sup>:

- cost-covering user charges, whereby those making use of the environment contribute to or cover the cost. The level of a cost-covering charge is determined by the service it is intended to deliver and revenues are primarily used to finance collective services or manage natural resources. These most closely resemble “market prices.”

- revenue-raising taxes, which may influence behaviour but still yield substantial revenues over and above that required for related environmental services or regulation.

- incentive taxes, which are levied with the objective of changing environmentally damaging behaviour without the intention to raise revenues. Indeed, the success of such a tax may be judged by the extent to which initial revenues from it fall, as behaviour changes.

The environmental taxes (incentive taxes) are based on the work of Pigou (1920). Pigouvian taxes involve setting a charge per unit of emissions equal to the total value of the damage caused by an extra unit of emissions.

This signals the true social costs to the emitter, who then has a financial incentive to reduce emissions up to the point where the profit/loss due to a unit reduction in emissions is equal to the damage involved. In this way, the maximization of firm profit is obtained at the same point where the socially resource efficient allocation is.

The main purpose of this Pigouvian tax is the one of economic efficiency. A tax on transmissions takes into account three elements:

- the reduction of the spilled quantity: the tax increases the marginal production cost and, reducing the balance quantity on the market.

- technical substitution: the tax forces the factory to use unpolluting activities if the unpolluting cost is inferior to the saved tax.

- development and research: the tax encourages the factory to develop new techniques of production and reducing of pollution that can allow them to avoid paying the tax.

There are also financial taxes, the main purpose of which is financing. These taxes reflect the payment of the public services. Their effect is to encourage since the marginal cost is positive for the user.

While those instruments can improve cost-effectiveness and confer positive environmental effects, their implementation requires strong institutions in the financial and environmental sectors.

Major barriers to the use of environmental taxes and charges in developing countries are<sup>4</sup>:

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<sup>1</sup> Glossary of Environment Statistics, Studies in Methods, Series F, No. 67, United Nations, New York, 1997.

<sup>2</sup> Report on the use of economic instruments for environmental policy in Central and Eastern Europe, prepared by The Czech Republic and Regional Environmental Center for Central and Eastern Europe at the fourth ministerial conference “Environment for Europe”, Aarhus, Denmark, 23 - 25 June 1998

<sup>3</sup> Stefan Speck, Jim McNicholas and Marina Markovic, Environmental Taxes in an Enlarged Europe, *An Analysis and Database of Environmental Taxes and Charges in Central and Eastern Europe*, The Regional Environmental Center for Central and Eastern Europe, Szentendre, October 2001

<sup>4</sup> \*\*\*, *Financial resources and mechanisms*, Report of the Secretary-General, Commission on Sustainable Development, 2000

- the lack of institutional capacity,
- the complex tax design requirements and the limited experience of mainstream public finance agencies in dealing with the introduction of such taxes,
- the difficulty of dealing with tax fraud with environmental taxes, fraud which may provide an additional benefit to the use of environmental taxes

Subsidies are another important economic instruments used in order to encourage diminishing pollution or the economic incidence of public settlements. Subsidies are all forms of explicit financial assistance to polluters or users of natural resources for environmental protection, e.g. grants, soft loans, tax exemption, tax relief, and accelerated depreciation.

There are two kinds of subsidies:

a) producer subsidies, which are any form of intervention which lowers the cost of production of a producer, or raises the price received by the producer, compared to the cost and price that would prevail in an undistorted market;

b) consumer subsidies, which are any form of intervention which lower the price that the consumer would pay if there was a free market in the commodity in question.

Subsidies are frequently introduced for social or economic reasons.

Harmful effects of subsidies tend to come about because<sup>5</sup>:

- the subsidy causes too much production or harvesting of the subsidised product, and hence too much associated effects such as pollution or resource depletion;
- governments have to find the money to pay for subsidies and this will come from taxation or borrowing, causing macroeconomic problems, or, at the very least, diverting money from socially valuable uses such as health and education;
- overproduction caused by subsidies in the developed countries has to be disposed of, and this may result in "dumping" the excess production somewhere else, perhaps in developing countries, undermining their economies;
- subsidies also divert resources away from higher value uses to low value uses;
- subsidies mean that true costs of supply are not recovered, which implies that the utilities supplying energy, water and so on, may not have enough revenues to secure surpluses that they can invest in new supplies;
- subsidies create "economic rents" – money for doing nothing – and hence attract "rent-seekers".

Deposit-refund systems are payments made when purchasing a product (deposits) and which are returned (refunded) when the product is returned to the dealer or a specialised treatment facility.

The deposit-refund-systems have been used for many years in order to control the evacuation of the beverage pack. They contribute for the prevention of the transmissions of toxic substances resulted from the electric bacteria or from the cremation of the plastic matters or of the waste products that come from the receptacles in which we keep pesticides. The efficiency of the deposit-refund-systems imply low administrative costs, because once the sum is paid, there is no other extra intervention of the public authorities that takes place.

Marketable permits, rights etc. are based on the principle that any increase in pollution or resource use must be offset by a decrease of an equivalent quantity (often referred to as "emissions trading").

In a system of marketable permits, the regulatory authority allocates permits equal to a determined aggregate quantity of emissions, possibly, but not necessarily, through an auction. The

<sup>5</sup> D. Pearce, D. Finck von Finckenstein, *Advancing subsidy reform: towards a viable policy package*, in volume *Finance for sustainable development. Testing New Policy Approaches*, United Nations, New York, 2002



permits are tenable for a defined period (or perhaps indefinitely) and tradable. Trading of permits among emitters will establish a market-determined price of emissions, which will signal damage costs and give emitters financial incentives to respond by reducing emissions.

Table no.1

### Summary of Efficiency Considerations and Market Structure

<i>Market Structure</i>	<i>Emission Tax</i>	<i>Tradable Permits</i>
Perfect competition	Efficient	Efficient
Noncompetitive market structure in the output market	Efficiency can be achieved by suitably adjusting the Pigouvian tax but only if firms are all identical. Inefficient when firms have different pollution technologies.	Inefficient but literature suggests that efficiency losses may be smaller than under an emission tax (when firms have different pollution technologies).
Noncompetitive market structure in the permits market	n.a.	Inefficient

Source: J. Norregaard, Valérie Reppelin-Hill, *Taxes and tradable permits as policy options for controlling pollution: a review of country experiences*, in volume *Finance for sustainable development. Testing New Policy Approaches*, United Nations, New York, 2002, pag. 198.

The choice of the appropriate instrument for achieving sustainable development objectives should be based upon cost efficiency, taking into account the nature of the damage and the uncertainty of its effects, the administrative and enforcement costs as well as public acceptance of the various instruments.

Various instruments interact in complex ways and each policy instrument has its advantages and disadvantages, so that the choice of economic instruments can be difficult. It is desirable to use a combination of instruments so as, by their efficient and effective action, to obtain good results.

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5. *\*\*\*, Financial resources and mechanisms, Report of the Secretary-General, Commission on Sustainable Development, 2000*