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# PRODUCT CHARGES AS AN ECONOMIC INSTRUMENT TO INTERNALIZE ENVIRONMENTAL NEGATIVE EXTERNALITIES – NATURE, OBJECTIVES AND CRITERIA FOR DESIGN AND IMPLEMENTATION

## 1. Introductory remarks – general rationale for imposing product charges on environmentally arduous goods

The possibility and purposefulness of an extensive application of economic instruments for the achievement of specific targets of environmental policy ensues, first of all, from the fundamental premise that under the *hard money budget constraint* (which is of crucial significance to a market economy) such instruments affect the costs borne by producers and consumers, thus encouraging them to limit environmental externalities brought about by production and consumption.

Another argument is that product charges imply widening the real scope of the application of the *Polluter Pays Principle* (as one of the main foundations of contemporary environmental policy) and, in particular, affecting consumer behavior by this principle. This is of key importance, since almost all the economic instruments of environmental protection are intended to address the economic behaviour of producers of environmentally arduous goods (the only significant exception is user charges). Thirdly, the implementation of product charges mean a wider implementation of the distributive justice principle when using economic instruments for environmental protection. Last but certainly not least, product charges may bring about the abatement of emission of specific pollutants

(waste), thus contributing to a wider application of the prevention principle (abatement of pollution at source) in environmental policy (given their incentive function). This will occur, in particular, when product charges force consumers of environmentally harmful goods to reduce their consumption or to substitute them for more environmentally sound ones. One cannot ignore the fact that a wide application of such an instrument also supply public budgets (central and local) or earmarked environmental funds with additional financial means.

Summing up these introductory remarks, it is necessary to emphasize that economic instruments for environmental protection should always be perceived as a factor which strengthens and does not replace direct (legal, administrative etc.) regulation measures. However, it is worth recalling here that economic instruments for environmental protection, given their correct design, implementation and performance, may contribute to a substantial decrease in the costs of achieving the targets set by state environmental policy. On the other hand, while generating revenue to earmarked environmental funds and/or various public budgets, the instruments in question, and different environmental charges and taxes in particular, generally increase the possibilities of publicly financing environmental protection.

## 2. Product charges vs. general criteria for using economic instruments for environmental protection

Based on the subject literature, as well as the respective experience of many Western European countries,[1] the following definition of product charges may be formulated: Product charges are non-refundable financial burdens imposed on products which cause damage to the environment either in production/consumption or post-production and post-consumption phase.

The essential features of product charges may be, in turn, summarized as follows:

1. Subjects charged: final users of a given good (both producers and consumers).

2. Product charges are a kind of surcharge on the price paid by final users and as such they are not a cost to producers. Therefore, product charges should not result in additional tax load for the latter.

3. Product charges are not a sort of „environmental fine" (penalty) or tax.

[1] Survey of this literature may be found in: Czaja et al. [1996]. See also OECD [1999].

Against this background, it must be stressed that it is frequent practice to consider product charges a kind of tax burden imposed on consumer or production goods which are harmful to the environment. This is not justified and leads to obscuring the very nature of this specific environmental protection instrument. Moreover, considering product charges as an additional tax burden may result in both decreasing the interest and involvement of environmental policy makers in implementing them and in weakening the social support for this instrument.

Various economic instruments for environmental protection and natural resource management differ with respect to methods, scope and distributive and allocation outcomes. Such instruments aim at the internalization of environmental production and consumption externalities. With respect to the foundations of the environmental and natural resource economics, and the theory of external effects and cost–benefit analysis in particular, when designing product charges and other economic instruments for environmental protection the following general principle should be taken into consideration: The overall sum of identifiable and estimable social benefits consisting of the reduction of welfare losses related to the use of a good to be covered by a given instrument has to be larger than its overall implementation and realization costs. The latter also comprise the losses in welfare linked to increased costs and prices (caused by the introduction of a given instrument) to be paid by producers and consumers (households, other firms and the government sector).[2]

This criterion refers directly to the essential statements of so called normative regulation theory which, in turn, is based on neoclassical welfare theory.[3] According to this theory, the introduction of specific regulatory measures (both direct and indirect) by the state is generally justified when a certain market failure occurs. In other words, when allocation of scarce resources by way of the market mechanism does not lead to a Pareto-optimal equilibrium, there is a loss in the social welfare. From the point of view of this paper, this is the loss caused by excessive pollution of the natural environment. Public regulation can be, however, accepted only when the benefits from improving the market as an allocation mechanism, due to the application of a given regulatory measure, exceed the loss in welfare. Furthermore, if this loss is relatively small, precaution in using public regulation instruments to improve the effi-

[2] An extensive survey of the theory of external effects and cost-benefit analysis can be found in Fiedor [2002] Chapter III and IV.

[3] For a detailed discussion of normative, as well as economic, theory of regulation see Kahn [1991], Viscusi et, al. [1997] and Fiedor [2001].

ciency of the market mechanism is needed. There are at least two reasons for this. Firstly, we should always remember the fact that in the real world we have to frequently deal not only with market failures, but also with state failures (public regulation failures). The latter simply means that public regulation may also lead to a loss in potential social welfare. Secondly, it may happen that the source of inefficiency of the market mechanism are not real features of the market (e.g. natural monopolies, information imperfections etc.), but the state regulatory activity as such. In other words, one cannot exclude the situation where state failures directly cause the occurrence of market failures.

It is extremely difficult to use the criterion outlined above or to directly apply the main statements of neoclassical welfare theory and normative regulation theory in the process of designing and selecting economic instruments for environmental protection. This is for two reasons. First and foremost, there are essential difficulties concerning the identification of the costs and benefits related to environmental protection and pollution. Secondly, these are connected with high costs and long duration investigations that are necessary to estimate these costs and benefits, and its monetary valorisation in particular. Therefore, when designing and implementing the instruments under consideration, such general criteria should be taken into account for which the consistency of a given instrument with them can be easily checked on the basis research, which is of low-cost and not time-consuming. In accordance with the methodology which is commonly used and recommended by the OECD, the most important of those operational criteria are as follows [OECD, 1991]:

- Environmental effectiveness (potential and actual).
- Economic efficiency.
- Distributive justice.

**Environmental effectiveness.** The criterion of environmental effectiveness always relates to clearly defined objectives of environmental policy. Thus, it may consist in achieving a specific ambient concentration standard at a local or national scale, or in the reduced emission of a given pollutant; once again, regionally/locally or nationally. By and large, the environmental effectiveness of economic instruments of environmental protection depends on the strength of their incentive function vis-B-vis the economic subjects (polluters) affected by them.

As far as product charges are concerned, their potentially high environmental effectiveness is linked to the fact that they directly influence a subject who pollutes the environment or consumes its resources. Secondly, this efficiency results from the commonness of product charges,

which simply means that they encompass all the users of a given environmentally harmful good, irrespective of the place of purchase (domestic or imported good). Finally, product charges may become an important instrument of environmental education and thus in an indirect way contribute to environmental amelioration or a decrease in the use of natural resources.

**Economic efficiency.** Economic efficiency is usually understood as:

1. Maximization of the following ratio: environmental benefits gained due to implementing specific measures/activities to the costs that are necessary to achieve these benefits.

2. The existence of a surplus of revenues (to the budget, environmental earmarked funds, etc.) generated by using a given economic instrument over the costs of its implementation and current realization (sometimes called the administrative efficiency).

The first of criteria listed above measures the "external efficiency" of a given instrument's operational system. By analogy, the second of these criteria may be named "internal efficiency". Experience related to the performance of product charge systems in highly developed Western economies show that almost all these systems meet the criterion of internal efficiency. Measuring the economic efficiency of product charge systems, or any other economic instruments for environmental protection, on the basis of the external efficiency criterion encounters crucial difficulties in practice. With respect to the complexity of this problem, I shall confine myself to the following statement: If we decide to introduce a product charge on a good whose consumption brings about serious damage or harm to the environment (e.g. mineral fertilizers) and we are able to roughly estimate the implementation and realization costs of relevant administrative and financial system, then the higher the efficiency according to both the first and the second criteria, the greater the decrease in consumption. At a given elasticity of demand, it will depend on the relative (as compared with the price) rate of product charge.

**Distributive justice.** All broadly understood environmental fees and charges influence, directly or indirectly, the prices of intermediate and final goods, as well as of factors of production. This in turn brings about distributive effects. The latter may assume various forms and differ considerably with respect to their scope. It may be, for instance, linked to the level of marginal abatement costs or the elasticity of demand for goods, whose manufacture is affected by a given economic instrument of environmental protection.

Distributive justice means, in particular, that environmental charges and other forms of financial burdens related to harmful environmental outcomes of production and consumption are of a common nature. In other words, they encompass all the subjects generating such outcomes. Secondly, the charges concerned are commensurate with the environmental diseconomies which they are intended to address. If a product charge is properly designed (see the following section of this paper), then it fulfils this criterion a *priori*, because the financial burden it implies is directly related to the quantity and environmental arduousness of a good charged.

## 3. Specific criteria for the choice of goods to be covered by product charges and for the differentiation of product charge rates

### 3.1. Criteria for choice (features of goods to be covered, conditions favouring high environmental effectiveness and economic efficiency)

Given the fulfilment of general criteria discussed above for using economic instruments in environmental protection and natural resource management, the next step should consist in defining some specific criteria, i.e. criteria relating directly to product charges. Based on these criteria, specific goods that are suitable for covering by such charges can be chosen. They should have the following features:

– Products used (consumed) in large quantities, but in a dispersed manner (e.g. by households).[4]

– Unit production or consumption does not bring about substantial environmental harm, but total consumption causes considerable damage to the environment.

– Easily identifiable products whose consumption may be easily measured.

– Products characterized by a high price and (sometimes) high demand elasticity.

– The existence (availability) of environmentally cleaner substitutes with regard to the goods to be charged with product charges.

[4] For goods that are used in large quantities, economically and technically more justified instruments are effluent fees (for water- and air-borne pollutants in particular). To some extent, product charges may be considered a substitute for effluent fees in the case of *dispersed emission*, which means the use of ecologically harmful goods in small quantities.

– The possibility of taking advantage of the administrative and financial (tax) systems already existing to implement a given product charge system [OECD, 1991].

The criteria listed above should not be interpreted in such a way that if any specific product does not meet them, then it cannot be charged. These are merely the conditions whose fulfilment should lead to an application of product charges, which ensures both a high environmental effectiveness (the achievement of relevant targets set by the environmental policy) and economic efficiency. Moreover, the criteria in question cannot be regarded as thoroughly separable ones. For instance, assume that at the present time there are no more environmentally sound substitutes available for a good to be covered by the product charge. Introducing this charge, we can however achieve an environmental goal through the expected decrease in the consumption of the product charged. Depending on the institutional arrangements adopted, the net revenue obtained from a given product charge can be devoted to financing research activities to develop environmentally less harmful substitutes which, in turn, might lead in the future to a further decrease in the consumption of the good charged.

By analogy, when a good we would like to cover by the product charge has a low price elasticity of demand, a charge can still be introduced. Furthermore, this case can even be considered advantageous from the point of view of the product charge income (transfer) function. On the other hand, a low price elasticity is information for environmental policy makers that for the existence of a potential incentive function, the product charge should be established at a very high level vis-ŕ-vis the current price of the good. It is also worth noticing here that a high charge plays an essentially educational function, because it turns attention to the importance of environmental problems related to the consumption of the product charged.

## 3.2. Criteria for defining charge rates and their differentiation

The level of product charges, as well as their differentiation, may in practice be subject to a „political game" or regulatory dispute, whose objective is the distribution of costs and benefits between the participants involved. These are, on the one hand, users, domestic producers and importers of goods to be covered by product charges. On the other hand, public administration bodies proposing to introduce such an economic instrument of environmental protection and to organize the technical and economic-financial systems which are necessary for its implementations are participants of this "game". These bodies are the direct beneficiaries

of the revenue from these systems. In this game, some subjects may obtain unjustified benefits, due to the information they hold or lobbying activities. Regardless of that, one can and should require environmental regulation authorities to base their decisions on product charge rates on pure objective criteria (as discussed in this paper).

## Environmental arduousness related criteria for setting the rates

*General criterion: commensurability* with environmental diseconomies caused by product use or consumption of a given good.

*Specific criteria*: content of environmentally harmful substances in a good, amount of substances emitted/disposed of while consuming a unit of a given good and weight or volume of a unit of the environmentally harmful good.

*Auxiliary criterion:* avoidance of rates that might result in a lack of acceptance from consumers and producers (lack of social acceptability).

## Incentive and revenue raising function related criteria (bases) for setting rates

All economic instruments for environmental protection play – at least potentially – an incentive function, which is connected with their influence on the microeconomic calculus of economic entities being subject to these instruments. Simultaneously, they also play an income transfer function, which consists in generating revenue for public budgets, earmarked environmental funds etc. From the operational point of view, the *revenue raising (transfer) function* consists in the existence of a surplus of revenue gathered relative to the overall costs of the technical-administrative system designed to implement and operate a given system of product charges. If a given product charge fulfils this function (according to the above understanding), then it fulfils the criterion of administrative (internal) efficiency of the system of product charges as defined earlier on in this paper. This can also be interpreted in the following way that the product charge must be high enough to ensure the self-financing of the system under consideration.

As far as the *incentive function* is concerned, its actual strength depends on two factors:

- Demand and/or income elasticity.
- Availability of more environmentally sound substitutes.

Thus, for instance, if we want to achieve a specific environmental target, which is the decrease in the consumption of a given good to be

covered by the product charge, then the lower the demand elasticity the higher must be its rate. Given, in turn, a constant demand elasticity, the larger the amount and the easier the market availability of more environmentally sound substitutes for the product charged the better the fulfilment of this target. It is of crucial significance here to make consumers aware and convinced that those substitutes are less harmful to the environment and that they fulfil to a comparable extent the main function of the good being substituted.

### Criteria for rate increases and rebates

Basing the product charge rates on the criteria outlined above does not imply that these rates cannot change over time. This rather obvious statement requires, however, additional explanation from the point of view of product charge management system. Hence, the following criteria seem to be of key significance in the process of making decisions on rate increases and, on the other hand, rebates:

A. Inflationary adjustments of rates.
B. Increases in rates as resulting from striving after:
   (i) Reduction in the emission of air- and waterborne pollutants and waste disposal.
   (ii) Development of environmentally sound products.
   (iii) Increase in the revenue collected enabling public authorities to promote the development of cleaner substitutes and/or more environmentally sound "consumption technologies".
C. Rebates:
   (i) *as decreases in rates*, serving to encourage the manufacturers of goods covered by a given product charge to introduce a cleaner substitute (applicable in cases where the implementation of a program to introduce a product charge has already begun and will be completed within a time period agreed upon with the respective environmental agencies);
   (ii) *as refunds to consumers*, serving to encourage them to dispose of goods in an environmentally sound way or other desired behaviour patterns in the post-consumption phase (to be applied in mixed systems, i.e. product charge – deposit/refund systems).

## 4. Concluding remarks

1. Product charges, as any other kind of economic regulation in environmental protection, cannot be considered as a substitute for direct regulation in this realm. For instance, the process of the introduction of

product charges on detergents containing phosphates should be accompanied by an increasing rigidity of direct regulation, and setting more and more restrictive standards on the maximum permissible content of phosphates in particular. Similarly, the introduction of product charges on non-refundable (one-use) consumption packaging should be connected with the widening of the legal liability of enterprises producing and distributing goods sold in such packaging in the sphere of package collection, re-use and recycling (as is commonly the case in EU countries and exists in an initial phase in Poland after a new law on product charges and packaging waste came into force in 2002).

2. Product charges may, like other economic instruments, enhance the effectiveness of direct regulation measures, as well as create flows of revenue that can be used for financing the necessary technical and institutional infrastructure for the effective performance of direct regulation. A good example here is the system of package waste management mentioned above.

3. Product charges, when adequately high with respect to the market prices of goods to be covered by them, may induce suppliers (producers, importers) and consumers to evade legal regulations through the illegal introduction into the market of goods not burdened by the charges concerned. The actual scope of such activities will depend on a specific cost-benefit calculus of evading the law. These costs, in turn, will be dependent on the risk of uncovering such activities. It additionally justifies the need to develop and strengthen parallel the direct regulation system for goods being covered with product charges.

4. While designing product charge systems, the criteria and conditions which are essential to their environmental effectiveness and economic efficiency should always be taken into account. This refers both to the criteria for choosing the goods the product charges are to encompass and to criteria for setting the level of charges and their differentiation. If this is not the case, then one cannot exclude that the charges under examination will only play merely temporary fiscal or propaganda functions thus contributing very little to solving or mitigating environmental problems, which they can and should address.

## Literature

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