FLEXIBILISATION OF ENVIRONMENT TAXES - A MAJOR OBJECTIVE FOR THE EFFECTIVE USE OF NATURAL RESOURCES AND POLLUTION CONTROL

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Abstract:

Gradual depletion of deposits of some kind and increasing costs in the extractive industry influence negatively also the economic production in other fields of material production. Relieving the national economy of this influence requires attracting new sources (as a kind) of raw materials and energy in the economic circuit and, at the same time, diminishing the specific consumption in the processing industry and other activity fields. Such changes will inevitably influence the environment, worsening the living conditions, even on a world scale. The market will never solve the environmental problems in the mineral resources exploitation sector. Therefore, countries try to prevent this phenomenon by imposing taxes on pollution, but the amount of taxes or the taxation procedure is a question of economic policy for every country.

Keywords: natural resources exploitation, tax on pollution, external cost, marginal cost, environment protection.

JEL Classification: A_{12}, B_{40}

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In his theories, Georgescu-Roegen approached almost all aspects constituting the object of scientific debates in his time: integrability in the theory of demand, lexicographic ordering of preferences, utility, environment protection a.s.o. In his 1954 article “Choise, Expectations and Measurability”, already classical and widely cited, the author focuses his attention on the lexicographic ordering of preferences. This enables him to prove what he calls “ordinalist fallacy” and search for the origin and implications of probabilistic preferences.

As Georgescu-Roegen was going deeper in studying neoclassical theories and relating them to the economic realities in the developed countries, he gradually understood that many researches done within the limits and in the spirit of neoclassical school were still wandering in an abstract world, being far from giving answers to many questions posed by the economic and social life.

Ecological research, lately stronger and stronger, has revealed the systemic characters of the entire world life, the close interdependence between environment and human activities, as well as the causes of some imbalances in the entire system, having negative effects on life, in general, and on human life, in particular (Marcus, A., 1980).

On the other hand, economic research has began to consider the ecological phenomena and analyse data and information concerning the economic-social relationship by taking into account ecological constraints to draw conclusions on the effects of such constraints on the economic-social life, including the quality of life, as well as on the effects of human action on improving the environmental conditions (Constantinescu, N.N., 1976; Bonnefous, E., 1976; Seneca, J.S., Taussing, M.K., 1979).

Several theoreticians and practioners of the ecological movement from developed countries point out that nature safeguarding “has two objectives: preserving the fundamental resources - air, water and soil - in the form and the proportion required for man’s well-being; to preserve the nature elements necessary for man’s development on an esthetic, educational and scientific plane” (Bonnefous, E., 1976).

The progress made by Romanian researchers in this area materializes also in the idea that the quality of environment is a major component of the quality of life (Constantinescu, N.N., 1976). The implications of the quality of environment for the quality of life worsened the economic problems related to expenditures on environment protection as against benefits (Pearce, D.W., Markyanda, A., 1989). The allocation of natural resources should not only aim at maximizing the environment protection, as many ecologists often say. The allocation of resources should consider an optimum level of all effects in man's or society's interest (Beckerman, W., 1975).

Following empirical observations and studies, it is found that there are dependence relationships between the level of polluting waste diminution, on one hand, and the cost and the positive effect of pollution control and diminution, on the other hand (Sandbach, F.E., 1979). For example, it is proven that the evolution of the total cost of the anti-pollution measures in relation to the pollution level traces an exponential curve (Pearce, D.W., 1980). The first measures to diminish the concentration of pollutants have the strongest effects; then, the additional measures taken to reduce waste, having similar favourable effects on quality of life, require more and more expenditures. At the same time, the findings show that the evolution of favourable effects on the quality of life to reach various pollution levels trace, approximately, logarithm or semi-logarithm curves. Therefore, there is a permanent requirement to determine the limit where expenditures ensure the greatest benefits as regards the quality of life.

Economically, the maximum limit to which expenditures can be made to protect the environment is the point where the total cost equals the total positive effect. A careful investigation reveals that a null difference between positive effects and cost may occur in a predictibile future only if industrial technologies do not change or they develop at a lower pace than the environment deterioration (Farrell, J., 1987). Reality proves that the progress in improving or implementing new technologies made in the last three decades are greater with regard to the pollution elimination, the use of new polluting resources or the replacement of the polluting resources with cleaner or less polluting ones. The unsatisfactory situation caused by advanced pollution in some countries or regions is determined not by the lack of technological solutions, but by the long neglecting of these major problems due to either unawareness of the extent of the phenomena and the negative effects or the scarcity of economic mechanisms to satisfy immediate interests, without considering the individual's and community's quality of life.

First, we have to understand the various costs of pollution control (Pearce, D.W., 1990). Irrespective of the initial way of funding the pollution elimination, the population bears the tax burden as follows:

1) As tax payers, when it faces high taxes since subsidies are granted to companies that provide pollution control installations and equipment;

2) By increasing prices of products, since as long as subsidies cover only part of the cost of the pollution removal equipment and other part is borne by the companies that installed them, the economic agents transfer a part of this burden to the population;

3) By additional payments in the future, since, if we consider the level of the payments made by companies to install pollution control equipment and the smaller investments in other equipment, the rise in productivity and production is small;

4) By losing jobs, due to the fact that the pollution control standards caused the shut-down of enterprises, and, although the public cost is low, even the people living close to big pollution companies prefer pollution instead of job loss.

Therefore, the cost of pollution control affects us all in a way or other (Winpenny, J.T., 1991).

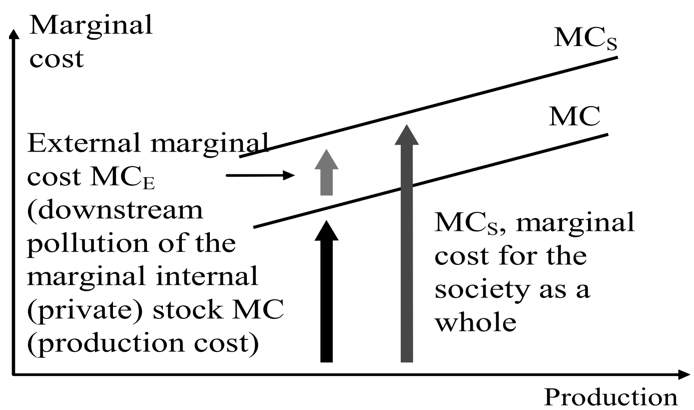

Figure no. 1. With pollution, private and social costs are different

Source: Winpenny, J.T., Values for the Enviroment, 1991

Since it is very costly to control pollution, the cheapest methods are selected (Figure no. 1). First, we have to see why the government's intervention is crucial. Why does the private market fail? (Bator, M.F., 1958) Why cannot somebody count on the "invisible hand" of Adam Smith to limit pollution?

The marginal cost of a product for the society, shown by the longest arrow MC_S, includes the internal marginal cost for the manufacturer (black arrow) and the external marginal cost not produced by the manufacturer (shaded arrow).

Pollution: **an external cost**. When there is pollution, the private and social costs are different. To see why, let us consider a gold mine.

The cost of gold for the society includes not only the private or internal cost of production, but also the cost for those who live in the mining area and face environmental pollution or risks caused by the production process, as we know gold is extracted by means of cyanides. While the company extracting gold must pay the internal production cost, any downstream cost is external to such operations as it should be borne by the others.

Internal or private costs are borne by those who actually produce and consume that good.

External costs, also known as neighbours' costs or spilled-over costs, are borne by the others. Pollution is such an example (Buchanan, J., Stubblebine, W., 1962).

Here, we consider a simple case. Let's suppose that each product unit is treated with a quantity of fluid discharged then into the water as waste. Let's also suppose that each product unit of this fluid causes a constant loss downstream. Therefore, each product unit obtained imposes a constant external cost of pollution, shown by the short shaded arrow, Figure no. 1. When added to the internal cost borne by producers (black arrow, MC), the result is the long arrow MC_s is constantly higher than MC according to our assumption regarding the constant external cost for each unit from the production obtained.

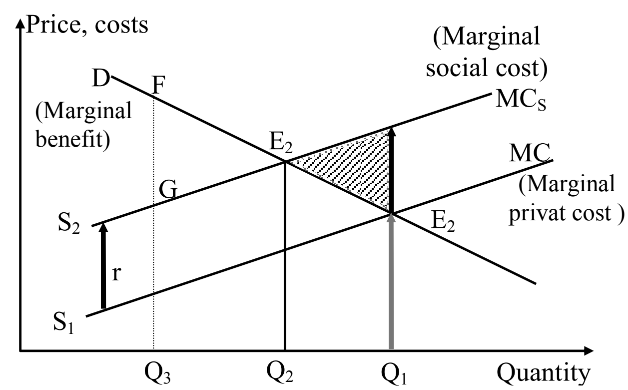

Figure no. 2. Loss in efficiency on the free market when there is an external cost

Pollution control: the simple case. When there is an external cost, even in a perfectly competitive market a wrong allocation of resources occurs, as shown in Figure no. 2.

Before the anti-pollution tax, the industry's supply is S_1, which reflects only the private internal costs of producers as against sellers. This supply equals demand in E_1 by a production Q_1. This production is inefficient since the marginal cost exceeds the benefit from all productions between Q_2 and Q_1. For example, the last unit Q_1 is not worth being produced; its benefit, shown by the shaded arrow below the demand curve, is smaller than the costs for the society (the shaded arrow plus the black arrow below MC_s curve). The loss in efficiency is the sum of these black arrows. i.e. the shaded triangle. After imposing tax **r**, producers have to face both the internal cost and the external one, so that their supply curve moves upwards from S_1 to S_2. D to S_2 are now balanced in t_2 through production Q_2. This is efficient since the marginal cost and the benefit are equal. The efficiency obtained by reducing the production from Q_1 to Q_2 is the elimination of the shaded triangle.

MC and MC_s are shown in Figure no. 1; demand D is the marginal benefit of this both private and social good. S_1 shows what companies want to supply. This curve measures the internal private costs – the only costs the companies can cope with when they decide to supply. With demand D and supply $S_{1,}$ the perfect competitive equilibrium is E_1.

For the society, E_1 is not an efficient income since it equals only the marginal benefit and the marginal private cost. An effective solution requires that the marginal benefit equals the marginal social cost MC_s. This happens at E_2 with a production smaller than Q_2. We conclude that in a free competitive market companies produce too much of a polluting good Q_1 as against the efficient quantity Q_2. The society's interest is to reduce the production of such goods and to use the resources for producing something else.

To prove that Q_1 is an inefficient production, we should note that the benefit from the last product unit is the shaded arrow below the demand curve. Anyhow, its cost is even higher as it includes both the private cost (the same arrow) and the external cost, shown by the black arrow. Thus, this black arrow represents the net loss for producing the last product unit from Q_1. As long as there is a similar loss for producing each unit "in excess" between Q_2 and Q_1, the total loss in efficiency is measured by the shaded triangle.

In this case, only one method is possible for solving the situation; imposing a unitary tax on the consumer equal to the marginal external cost indicated by the black arrow. Thus, the tax "internalizes" the externality (Olsen, M., Zeckhauser, R., 1970): the producer is forced to face the external cost and the internal cost. As a result of this tax, the supply curve moves upwards from S_2 to S_1; to confirm this, let us remember that supply reflects the marginal cost and this rose by increasing the tax to be paid. The new equilibrium occurs at E_2, where demand and the new supply S_2 intersect. This new production Q_2 is efficient because the marginal benefit equals the marginal social cost. Finally, the gain in efficiency through this tax policy is the shaded triangle, the initial efficiency loss that is now eliminated. Briefly speaking, owing to this tax, the society receives a benefit which the market would not offer: clean environment (Pearce, D.W., Markyanda, A., 1989).

Several ways to reduce pollution have been suggested. One of them consists in limiting the production of polluting companies; another one is the introduction of the property right (Montgomery, W., 1972).

Such a limit may or may not solve the problem: in fact, it is better than nothing. For example, let us assume that production is limited at Q_3. Considering the situation in Figure no. 1, one can show that producing less, there will be a loss to the society, triangle FE_2G. As long as this loss exceeds the initial loss, the improvement will be smaller than in the initial case. We may also see that a stronger limitation of production will cause a bigger loss in efficiency. Thus, an arbitrary limit to production could be an ineffective policy. A better approach – if pollution costs can be estimated – is imposing taxes on these quantities. Then, the correct level of pressure will be applied to the market to push back production from the initial Q_1 to the efficient production Q_2.

The control of pollution: the complex case. In practice, decision makers have to cope with situations more complicated than the above ones. First, pollution is not caused by one polluting industry. Second, pollution and production are not linked to only one situation similar to the above-mentioned one, when each additional production unit generate a constant quantity of pollutants; in most cases, the latter varies. A good may be produced with a large amount of pollutants, when the waste is discharged without any restrictions in the water or the air. Anyhow, a small quantity of pollutants results if the waste is treated or if polluting fuels are used.

Let us consider a company that treats the waste or uses a cleaner but more expensive fuel. This company diminishes pollution but at a higher cost.

This cost paid by all companies in an area to diminish pollution is shown in Figure no. 3 as the curve MCR (R stands for pollution diminution).

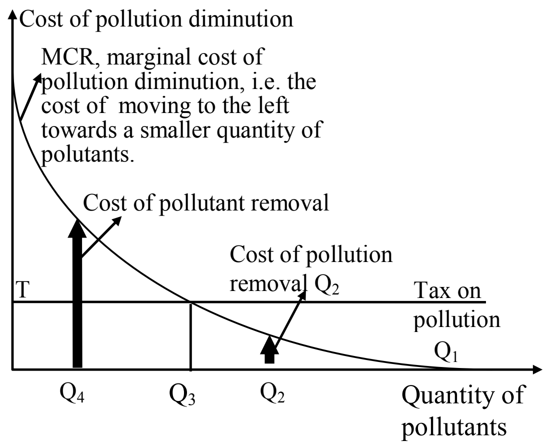

Figure no. 3. The cost of pollution diminution and the effect of a tax

Q_1 is the quantity of pollutants that might occur when no control measures are taken. By moving backwards to the left on MCR, we see the cost of pollution diminution for an additional unit – for example, by installing the pollution control equipment. Therefore, if pollution is limited on the way back to Q_4, any stronger diminution would imply very expensive anti-pollution measures and the cost shown by the high black arrow.

If a tax on pollution T is imposed, then companies voluntarily diminish pollution, moving from Q_1 to Q_3. As long as they are on the right side of Q_3 they continue to diminish pollution, since its cost (for example, the short black line) is smaller than the cost of tax payment. Anyhow, they will not move to the left of Q_3. On this side, they pay more for diminishing pollution (high black arrow) than continuing to pollute and pay the tax T.

We denote by Q_1 the quantity of pollutants in case of no restriction. While pollution is diminishing, companies move to the left on the curve MCR. Initially, the cost of pollution elimination is smaller. For example, the quantity of pollutants Q_2 may be eliminated at a low cost, shown by the small black arrow. Anyhow, by further diminishing pollution, the small curve becomes higher as companies move to the left.

Until several decades ago, there had been only a few restrictions on pollution. That is why companies preferred to discharge pollutants instead of treating them. The result was the quantity of pollutants Q_1.

To prevent this, the government wants to diminish pollution significantly. Suppose that we want to diminish it to half, from Q_3 to Q_1. The policies to be considered are the following (Marcus, A.A., 1980):

Option 1: Tax on pollution. Suppose that the government imposes a tax on spillage – i.e., a tax on each pollutant unit discharged in the environment. Specifically, suppose that in Figure no. 3 the tax T is paid for each pollutant unit. Then, companies eliminate pollution on the right side of the curve MCR, where costs are smaller to stop pollution (e.g., small black arrow) than to go on polluting and pay the tax T. Anyhow, pollution is diminished only towards Q_3, where the tax line crosses the curve MCR. On the left side of this point, the cost of pollution diminution is high, as shown by the big black arrow. In fact, the cost is higher than the tax T. Therefore, in this area, companies may be stimulated to pay taxes and pollute further.

Although "taxes on spillage" were strongly supported by economists (Buchanan, J., 1962), still they are not used very often. Anyhow, according to a similar approach, we find a few cases when companies are obliged to pay for pollution – even if it is not a payment directly linked to each pollutant unit. For example, EPA Superfund, a multibillion programme to remove the accidental chemical waste, was initially funded by imposing a tax on highly polluting companies.

Option 2: A physical limit imposed on the pollution level of each company. The following question may be raised: Why should we cause so many problems by imposing a tax on pollution, as in Figure no. 3, as long as pollution can be diminished by the same amount through a simple and direct control, i.e. asking each company to diminish pollution to half? The answer is that – even if this approach would diminish pollution to the same level – it implies higher costs than pollution removal (cleaning), as shown below.

Not all companies face the same costs for pollution diminution (Pezzey, J., 1988). By imposing a tax, pollution is diminished by companies that can do it at the lowest costs, i.e. companies on the right side of Q_3. Companies on the left side of Q_3 continue to pollute. Anyhow, if all companies are obliged to diminish pollution to half, the companies on the left side of Q_3 should also pay, in this case, even the cost indicated by the big black arrow.

Therefore, the advantage of a tax is that "it lets the market go on" (Seneca, J.S., Taussing, M.K., 1979). As regards the companies that respond to the tax, the pollution is diminished by companies that can do it as cheap as possible. Thus, the society provides less real resources for pollution elimination. Gains may be higher. Wallace Oates, University of Maryland, assumes that the tax on pollution would cost the society 75-80% less than a policy obliging all companies to diminish pollution to the same extent (Baumol, W., Oates, W., 1971).

Which of the two policies was adopted by the government? The answer is unexpected: instead of allowing the market to function with a few taxes on pollution, the governments used mainly regulatory controls. The physical limits on the pollution level were imposed on certain companies – a policy implying, as shown above, unjustified additional costs.

Now there are encouraging signs that governments seek for a third solution, a compromise one, that allows them to set physical limits to pollution, but at the same time to let market function and, thus, to avoid unreasonable additional costs.

Option 3: Physical limits imposed on the pollution level by contracting permits for pollutant emissions. The third option requires that the authorities set a specific limit for the quantity of pollutants allowed for each company (Krupnick, A., et al., 1983; Seskin, E., et al., 1983). For example, each company is allowed to pollute only half of the past pollution level. Up to here, the case is similar to Option 2. But at this moment, a turn point occurs to let the market function: companies are allowed to buy and sell "pollution permits". It can be demonstrated that in a perfectly competitive market, the permits will be sold at price T. The companies on the right side of Q_3 gain by selling permits at the price T and by taking pollution removal measures at a lower cost, as shown by the small black arrow. For the companies on the left side of Q_3 it is cheaper to buy permits T and go on polluting than to spend more on pollution control, which costs are indicated by the big black arrow. Thus, pollution is diminished only by the companies on the right side of Q_3, at the lowest cost. Therefore, according to Option 3, when permits can easily be sold on the market, pollution can be diminished at the same cost as by Option 1, which implies a tax on pollution.

That is why the effects of Options 1 and 3 are stronger than those of Option 2. Only according to Option 2 – when all companies are obliged to diminish pollution by a fixed unit – the high cost of pollution control is borne only by the companies on the left side of Q_3.

In this context, the general principle is: **Pollution can be diminished at lower costs when the government releases the market forces.** It can change incentives by imposing a tax or by introducing permits to be sold on the market and then letting the companies take action and respond to the new conditions. Companies themselves know better the cost level and, consequently, are able to choose the best way to diminish such costs.

The main conclusion is: Since Option 2 is not based on the market rules, it is more costly than Options 1 and 3. But by comparing Options 1 and 3, which one should be preferred?

A comparison between Option 1 and Option 3. These two options differ by something more significant. By Option 1, companies are penalized. If they go on polluting, they pay a tax. If they stop polluting, they must pay the cost of pollution control. In either case, they are reversely affected by the tax on pollution.

Anyhow, according to the Option 3, companies must not necessarily lose by the permits sold on the market. Actually, those paying the lowest cost for pollution control actually win. They can sell the pollution rights at a price T, which is higher than the cost of pollution control. While the companies paying a high cost for pollution control are reversely affected, as they do not lose as much as they would by imposing a tax as per Option 1. Why? According to Option 1, they must pay the tax T on all pollutant emissions. As per Option 3, they bear no cost for part of their pollutants, i.e. the pollution covered by the free permits granted to them.

The polluting companies prefer to apply Option 3 which becomes more attractive for the government. The productive activity does not significantly influence it as it can be easily assimilated by the law. Thus, pollution can be controlled without unreasonable delays.

In any of the cases, Option 3 raises a question. Why are the companies that polluted in the past entitled to permit? In other words, can some companies benefit from the past pollution? It suggest that, on equal bases, Option 1 is preferred since it penalizes the past pollution instead of rewarding it.

Therefore, it was assumed that the government aimed at diminishing pollution to half, to Q_3. Why not by 1/3 or 3/4 or any other rate? We present below how objectives can be prefixed.

How much can we diminish pollution? In Figure no. 4, MCR is traced as in Figure no. 3. Moreover, we also have here MPC, which is the ecological cost of the additional polluting units. The best objective is to diminish pollution at Q_3, where MCR = MCP.

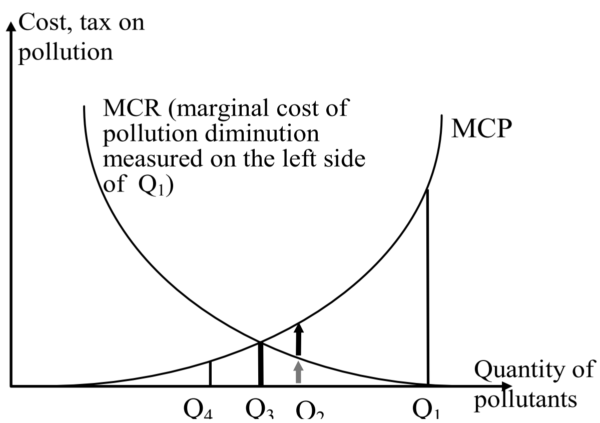

Figure no. 4. Efficiency loss by uncontrolled pollution

The two curves, MCR and MCP, should not be confounded. MCR is the cost of pollution diminution, for example, the cost of the pollution control equipment. On the other hand, MCR is the cost that allows pollution. As long as there is only a small quantity of pollutants – let's say, at Q_4 – the marginal cost allowing pollution (MCP height) is low. The first waste discharged in a flow is generally absorbed by environment. As pollution is growing, the emissions grow and become more dangerous; this means we have to move to the right, when the curve rises.

With this two curves, the best objective is the pollution diminution up to Q_3, where MCP=MCR. Any other quantity is not desired, as illustrated by the case when pollution is completely free and reaches Q_1.

For all quantities of pollutants found on the right side of $Q_{3,}$ MCP is bigger than MCR, so that it is a mistake to permit further pollution. To assess the social cost of this error, we consider such a quantity, let's say Q_2. The cost of the elimination of this quantity of pollutants is the height of the curve MCR, indicated by the hollow arrow. This is smaller than the cost of allowing further pollution (the height of the curve MCP, i.e. both arrows). Therefore, the net cost of allowing pollution is the black arrow. If we sum up the similar costs of all quantities between Q_3 and $Q_{1,}$ the result is the shaded triangle, i.e. the society's loss by allowing further pollution at the uncontrolled level Q_1 instead of limiting it at the level Q_3.

On the other hand, a policy to diminish pollution to the left side of Q_3 causes also a loss. For example, if pollution is diminished at Q_4, the cost of the last quantity unit is just the height of the curve MCP above Q_4. Anyhow, this last unit is exceeded by the cost of pollution control (the height of the curve MCR). Therefore, the elimination is an error.

In our opinion, the best objective, Q_3, can be found by considering both the cost of allowing pollution, MCP, and the cost of its removal, MCR.

Unfortunately, in practice it is not very easy to estimate the objective Q_3 because of the difficulty to estimate MCP and MCR. For example, when trying to estimate the marginal cost of pollution MCP, we do not know how hazardous pollutants are. Moreover, there are many pollutants, and the damages caused by each one may depend on the presence of others. Similarly, in the above-mentioned case the gold mining there is not only a physical pollution hazard caused by cyanides produced in the process, but also damages to tourism or other industries in a quite large area caused by the impact of the perception of the possible pollutant, cyanides.

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