

AN ECONOMICAL APPROACH TO THE PROBLEM OF THE INTERNALIZATION OF THE EXTERNALITIES AND MONETARY EVALUATION METHODS

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1- INTRODUCTION

As the "environmental goods" have previously been considered to be public property, they have not been priced. The evaluation of the natural resources appears as an "economical problem" before us naturally, because they are both not priced and extremely destroyed and some of the natural resources have the characteristic of regeneration. In other words, it has already started a new discussion that renewable natural resources have been converted from being "free goods" into "economic goods"; i.e., the natural resources have become "scarce goods" that have an important part in the theory of economics and how is it that all scarce goods have prices, "also the environment" should have a price.

The practice that the social cost and benefit of the natural resources as the factors of production are started to be reflected to the prices has disclosed the fact that the environmental goods such as the air, sea and soil that are considered to be free goods and are not the subject of private ownership should have prices.

The condition that there is a cost of the damage caused in the environment and it reflects to the price of the goods produced of it or that the prices include the costs of environmental pollution may be defined as the "internalization of the externalities" as an opinion that is becoming popular.

2- Economical Meaning of Externalities

"Externality is, in general, the condition that the benefit and/or cost functions of the other units are influenced positively or negatively, as a result of the production and/or consumption activity of an economic unit¹." Externality occurs out of the will and control of the unit influenced by the economic activity made by any economic unit². In this sense, it is possible to mention the externality at anywhere the other units are influenced by the activities of an economic unit and this influence cannot be eliminated by the rules of market economy. Externalities may be of two types as the "positive and negative externalities". If the activity made by an economic unit influences the other unit(s) in a positive way, then the externalities that occur are defined as the positive externalities or on the contrary, if the activity made influences those units that are outside of this activity in a negative way, then the externalities that occur are defined as the negative externalities.

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¹ Coşkun Can Aktan, **Kamu Ekonomi'sinden Piyasa Ekonomisine: Özelleştirme**, Akliselim Matbaası İzmir 1992, s.7.

² Firuz Demir, **Yaşamış Çevre Yönetimin Temel Araçları**, İmge Kitapevi Yay., Yayın no: 123, Ankara, 1995 s.160.

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The event that the garden of an estate presents a beautiful view to neighboring estates may be an example to the positive externalities, the air, water pollution and traffic jam caused by the development in the industry may be an example to the negative externalities.

Since A.C. Pigou, the economists advocated that it will increase the social welfare to take the externalities into account in the regulations concerning the decision-making of the private production and consumption³. However, currently it is not possible to say that the damage to the environment caused by a company polluting the air or water that are very important in the sense of social welfare is included in its costs. In our age, it has been understood that it is no more sufficient to say that the resources are being used in the most appropriate way, in case the marginal benefit is equal to the marginal cost. Thus it has also been necessary to take the problems that the society faces into consideration, beside these conditions. That is to say, it has also been essential to evaluate the "private and social costs", as the external economies exist and prices do not reflect the externalities⁴.

In conclusion, in case of the existence of the externalities in an economy operating under the conditions of perfect competition, the entire costs and benefit of an activity to the society will not be reflected to the market prices. For this reason, the person or company doing the activity will adjust the level of its activity so that its marginal benefit will be equal to its marginal cost. In case this activity extends a negative externality to the society, as the marginal social cost will be greater than the marginal private cost and therefore than the marginal private benefit, the level of the activity will be higher than the social optimum. Just on the contrary, in case the activity extends positive external economy, as the marginal social benefit will be greater than the marginal private cost, the level of the activity will be lower than the social optimum. In case externalities exist, the marginal social benefit should be equal to the marginal social cost, in order for an activity to be at the optimum level socially.

For this reason, the Pareto optimum condition for an activity causing a negative external economy is,

$$\text{Marginal private cost} + \text{Negative external economy} = \text{Marginal private benefit}$$

The Pareto optimum condition for an activity causing a positive external economy is,

$$\text{Marginal private cost} = \text{Marginal private benefit} + \text{Positive external economy}$$

The positive and negative economies in the equations will show the marginal cost or benefit of the persons other than the person doing the activity⁵.

3- Problem of Internalization of the Externalities

The principal goals and principles of the market economy are oriented to maximize the benefit of the consumer and maximize the profit of the producer. As the damage to the outside or social costs caused by the company while it makes production are not taken into consideration or only the point where the marginal income equals the

³ Halil Seyidođlu, **Ekonomik Terimler Ansiklopedik Sözlük**, Güzem yayınları No:4 Ankara, 1992, s.165.

⁴ Ruşen Keleş ve Can Hamamcı, **Çevre Bilim**, Imge Yay, Ankara, 1977, s.130.

⁵ Hasan Ertürk, **Çevre Bilim'ine Giriş**, Uludağ Üniversitesi Vakfı, Yayın No:10, Bursa, 1996, s.132.

marginal cost is taken as the basis in this principle, it is not possible to say that the market equilibrium reached in this way is effective⁶.

In other words, Pareto's optimum does not cover the externality and therefore the element of social benefit/cost. Since the public property is not divided and therefore not priced, Pigou claims that it will only be possible to find a solution to this condition to which the market economy cannot find a solution only by equalizing the social cost/benefit to each other.

"Internalization of the externalities" is to include the externalities not included in the operation of the market economy in the benefits and costs of the units creating the external influence by the intervention of the government to the market economy. It is aimed to create new areas of power and benefit where all positive or negative outcomes of the activities will occur by some regulations and to arrange the activities included in this area and to distribute the benefits and costs among the entrepreneurs and influenced persons to a definite extent by the internalization of the externalities.

Most of the economists have been previously explaining the reasons of the externality generally relating it to the technological conditions⁷. However, "Ronald Coase" have proved in his studies that the reasons of the externality are complex. According to this view that is expressed as the "Theorem of Coase": "There exists certainly the externality and pollution in case one possesses an economical or free commodity without charge".

Coase advocating that a way of compromise between the polluter and the polluted one may be found says that the way of compromise is the incentives. According to the theorem of Coase, if the externality could be converted into an internal matter for the one creating the externality, a solution economically effective, equal in the distribution of welfare and statistically peaceful would have been found. The principle, "the polluter pays" that is dealt with as a legal explanation of the economical instrument that is the internalization of the social costs constitutes one of the basic legal regulations for the protection of the environment⁸. Accordingly, it is intended to create the liability to take precautions necessary to eliminate the harmful results of the interventions that will create negative effects on the environment and to avoid such interventions and to make it to remain on the actor of such interventions.

In case the principle, polluter pays is applied widely, all social "costs caused by the pollution will remain on the polluter. This understanding will ensure the economical internalization of the external costs and create a responsibility mechanism for the ecological damages covering all outcomes of the pollution not only related to the persons and things, but especially related to the nature.

4- Means of Internalization

As it is impossible that the zero pollution level is attained in the environmental pollution, the basic goal in the economical analysis of the environmental pollution is to determine the "optimum level of pollution". The optimum level of pollution, with the

⁶ Orhan Türköz, *Cevre Meselelerinin Ekonomik Yorumu*, Yeni Türkiye Dergisi, 1995/5, s.321.

⁷ Öner Kabasakal, *Ekonomik-Çevre İlişkiler Üzerine Bir Deneme*, Yeni Türkiye Dergisi, 1995/5, s.333.

⁸ Sahir Çörtoğlu, *Kirlenen Öder İlkesi ve Ekolojik Zarar Kavramı*, Yeni Türkiye Dergisi, 1995/5, s.349.

most general definition, is the level of pollution that will start to create a social cost much more than the social benefit to be provided by the pollution decreasing measures.

The principal means that may be used in internalization are as follows.

1- Subsidies and Taxes

The subsidies depends of the thought that an improvement in the environmental quality is a positive externality. The subsidies are supporting the companies to make investments in the polluting units in order to decrease the pollution or to use less polluting technologies or supporting the non-polluting companies⁹.

The taxes mean to bring a necessity to an additional tax for the cost propagated by those that propagate negative external influence to the environment. As the pollution taxes will encourage the companies to prefer the alternative with the least cost, it may ensure the companies to use the less technologies and inputs. The pollution taxes will have effects that encourage the units causing pollution to determine the alternative with the least cost, make savings and considering the environment in their investments.

Even the conditions of perfect competition appear in an economy/ as many activities impose positive or negative economies on the society, the prices determined in the market will not reflect all social costs and benefits and the conditions of the Pareto's optimum will not be attained. In an economy running under the conditions of perfect competition, in order to attain the conditions of Pareto's optimum, the levels of the activities should be so that "marginal social cost = marginal private cost" will be attained. Thus in case a cost is imposed on the society because of an activity, a tax that will bring the level of the activity to such a level that "marginal social cost = marginal social benefit" will be attained. Otherwise, in case of a social benefit, a subsidy that will rise the level of the activity to the level, "marginal social benefit marginal social cost".

2- Fees

The principle called "the polluter pays" that is included in the environmental literature is applied in the air, water, noise and solid wastes in various countries. The fee that is known as the returns in cash that must be received from those that cause environmental pollution is one of the means of application that is rather used for the purpose of supporting the standards.

The fees that are determined by especially taking the regional and seasonal fluctuations into consideration are generally collected by the local units of administration and the income collected is used for the elimination and indemnification of the environmental damage.

3- Marketable Polluter Permissions: Bubble Theory

The bubble theory is based on the assumption that the atmosphere surrounding any settlement area is assumed to be a single air bubble. According to this theory, the air quality reaches a definite value as a result of many activities in the city. In case the city administration finds the air quality in the air bubble of the city appropriate for the human and environmental health, gives a permit to the pollution sources in the city indicating the maximum emission of pollution they would cause and bans causing emission beyond the limit. The sum of the permits given are at the level that will assure ' the standardized city air quality. After this stage,

⁹ Hasan Ertürk, *Çevre Bilimlerine Giriş*, Uludağ Üniv.Vakfı Yay., No: 10, Bursa, 1996, s. 132.

no new permits are given to any enterprise and those that wish to get polluter permits should buy the permits from those that are previously given that permit by paying a charge. The one that sells the permit, as it will be unable to receive a new one, will either close its business or bring its technology to a cleaner position. However, the both situations will ensure the maintenance of the air quality of the city at the desired level and prevent the new polluters from appearing. The polluter permits may be given without charge by the authorized public administration as well as they may be sold to the interested persons by auction.

4- Deposit Fees

This method is started to be used for the purpose of environmental protection. This method is applied especially for some goods that have economical values and are "reusable".

2- Market Value of Environmental Goods

The methods that take the changes that may arise in the market value of the environmental resources as a result of environmental pollution are called "market (or monetary) evaluation methods". Especially with the monetary evaluation methods, the negative effects of the environmental pollution on human health and cost of the health expenses are determined. However, it is being observed that the said methods are insufficient in some cases. For example, it is not possible to say that the monetary evaluation methods are sufficient in the determination of the biological diversity and some other natural resources.

The market value methods are divided into three groups as the evaluation methods depending on the effects measurable in the traditional markets, methods depending on the effects measurable in the indirect markets¹⁰.

2.1. Evaluation Methods Depending on the Effects Measurable in the Traditional Markets

The basic characteristic of these methods used to study the effects of a change in the environmental quality on the real production or the productivity of the resources, i.e. efficiency is that it depends on the market prices. The said methods are the efficiency change approach, labor force income loss approach, substitution cost and alternative cost approach.

2.1.1. Efficiency Change Approach

It is known that all economic activities have positive and negative influences on the production capacity of the environmental resources. That is-, the environmental pollution may cause the regular product efficiency to decrease and the quality of the products to decrease for example in agriculture. The both of these two cases are calculated according to the efficiency change approach as follows.

1- Decrease in Product Efficiency

The level of the decrease in the regular efficiency of an agricultural product is generally determined by the land studies. The gross loss of the producer is determined by multiplying the amount of decrease found by the farmyard price.

¹⁰ Harun Tanrıvermiş, "Çevresel Malların ve Kirliliklerin Zararlarının Değerlerinin Biçilmesinde Uygulanan Yöntemle Bu Yöntemlerin Türkiye'de Uygulanabilirliği Ekonomik Yaklaşım, Cilt.8, sayı 24-25, 1997, s.90.

2- Losses in Product Quality

The value of the loss in the product quality may be measured using the market selling price. If it is not possible to sell the damaged product, the market price is directly taken as the quality loss. But if it is possible to sell the product, the quality loss is determined by subtracting the selling price of the damaged product from the unit market price.

2.1.2. Labor Force Income Loss

The labor force income loss is rather used in the economical analysis of the environmental impacts caused by the highways, airways, railways and industrial plants especially in the big cities. This method is used to find the losses of income that arise and caused by the loss of labor force in the events of early death, illness and inability to work and to calculate the monetary value of the increasing health expenses and to find the damage on the human health. For this, the labor force values before the deaths or illnesses may be used and the substitution cost of the increasing health expenses is calculated.

2.1.3. Protection Expenses or Prevention Expenses Approach

The protection cost approach is based upon the assumption that the use of the natural resources has no impact on the environment or this impact may be minimized by the measures to be taken. The cost of investment required for the elimination of the environmental damages is estimated. This is made by taking the market prices into consideration and estimating the cost of investment required for the elimination of the environmental damages.

2.1.4. Substitution Cost Approach

In case there are goods in the market that may be substituted by the goods and services to be provided from the environmental resources, this approach is preferred. The reason of this is that the value of the environmental goods may be determined by the prices of the substitutes of these goods observed in the market. Estimation of the value of a fish species that is not sold in the market using the selling prices of the similar fishes in the local markets may be an example to the application of this method.

In the substitute commodity approach, the value of a damaged commodity is determined by calculating the production cost of the commodities that may be substituted by this commodity.

2.1.5. Alternative Cost Approach

The alternative cost approach is applied by being used together with the substitution cost approach. Alternative cost approach depends on the assumption that the environmental assets are limited and this is a method used rather when the existence of the resources is endangered.

A "shadow project" that may substitute the environmental goods and services that may be destroyed because of an economical activity and may produce the environmental goods and services and this method is applied by taking the cost of the project as the basis. Example: A project is designed that will allow to produce a product similar to any species destroyed by the vegetable and animal production. The cost of this project is determined and the value found is called the value of the species

destroyed by the pollution or the value of the damage caused by the destruction of the said species by the pollution.

2.2. Evaluation Methods Depending on the Measurable Effects in the Indirect Market

As the environmental goods are not sold or bought in the market, these methods are applied by using the market information indirectly. In this method, the additional evaluations to the market prices of the goods and services similar to the goods and services produced by the environmental resources.

These additional values are as follows:

- Immovable value and hedonic price function
- Labor force wage
- Travel cost

2.2.1. Immovable Values Approach and Hedonic Price Function (HFF)

It is known that the environmental resources have an important part in the determination of the value of the immovables. As the value of the local houses located in the regions where there are water springs increases, the value of the local houses located in the regions where there is much noise or an airport decreases. However, as the closeness to the business centers brings commercial advantage, the parks highness of the environmental quality and environmental possibilities bring rental advantages to the landlord. That is, the values of the immovables with different location, and environmental characteristics will also be different. The Hedonic Price Function (HFF) is used to determine the amount of reflection of the differences in the environmental quality to the value of the immovables and to estimate the number of the persons who want the improvement of the environmental quality and the amount of money they want to pay for this improvement and the social value of this improvement by using statistical methods. However HFF approach have some insufficiency as it is not so easy to use and the mathematical and statistical data are insufficient.

2.2.2. Labor Force Wages Approach

As it is known, labor supply, number of the workers who want to work, duration of work and density of labor depend on the life and working conditions of the region. In this respect, in order to attract sufficient labor force to the regions where the pollution is high, it may be necessary to pay more to the labor. That is, in order to attract more labor force to the regions where the pollution is high, the wage that is higher than the marginal production value of the labor. It is obvious that there must be the conditions of perfect competition in the labor market, in order to obtain positive results from this method. The information on the health risk related to this method that sets a special value for the health risk is applied by establishing a meaningful relation between the health risk and return of working under these risky conditions.

The effects other than the environmental conditions influencing the wage level are eliminated and the wage is related to only the environmental effects in this method.

2.2.3. Travel Cost Approach (SMY)

This method is rather used to determine the values or benefits of the rural and urban recreation facilities, natural culture areas and natural wonders. Starting from the

services produced by the natural resources such as the parks, lakes, forests, picnic and recreation areas, in place of determining the values of them, it is easier to determine the time of travel spent by the people and their cost. In the evaluation, the "Hotelling-Clawson" method is used. According to this, the number of the recreational travels is inversely proportional to the distance of the airport. That is, if the distance to the airport increases, then the number of the recreational travels will decrease and as the distance to the airport decreases, the number of the recreational travels will increase. However, as an environmental resource moves away from the center where it is located, the time of travel and therefore its cost will increase and therefore the number of travels will decrease.

As this method is being used in practice, one faces many problems. These are as follows:

1- Time costs: The value of the time that is a reflection of the real recreation value provided by the visitor from the airport visited should be added to the price of travel. However, it becomes a problem how to evaluate the time, e.g. each hour spent.

2- Data collection: for the measurement of the benefits of the environmental improvements, the degree that how desirous the families are to pay money in each income group must be known.

3- Calculation of the real cost of travel: the cost of visiting a region must include the entrance fees, and the opportunity cost of the time of travel.

2.3. Evaluation Methods Depending on the Measurable Effects in the Designed Markets

Design of artificial markets is required for the evaluation of some environmental goods

2.3.1. Conditional Evaluation Method (KDYB)

This method that finds a wide area of application has been developed for the determination of the goods that are not sold or bought under the regular market conditions and therefore has no market data. The relations between the level of pollution-in the evaluation and the wastes discharged by the enterprises and the relation between the effect not measurable monetarily within the framework of the current market conditions with KDYB that is a direct evaluation method.

2.3.2. Delphi Technique and scenario Method

In the environmental evaluations, beside the techniques based on the mathematical models, the methods depending on personal opinion and including subjectivity in itself are also used. As these techniques include some prejudice to a definite extent, it makes estimates for the long run towards future depending on intuitive thought. However, though the scenario method depends on the personal opinion, Delphi technique depends on the technique of thinking and making decision in a group. As delphi that is the method of time determination or envisaging for the events of future depends on the decision of a definite group, it eliminates the problems caused by the subjectivity of the scenario method and becomes complementary to it.

In order to study the changes that may occur in the environmental quality, the methods of writing a scenario, playing roles and the science fiction may also be used.

Writing a scenario starts from a designed series of assumptions.

Delphi technique is a method more widely used among the decision-making methods. Its main purpose is to constitute a consensus in a group making estimation. The stages of this technique may be listed as follows.

The first stage; the experts who will make estimations related to the future are elected from the individuals who have creative intelligence and proved their scientific capability and qualification. The elected persons are requested to make estimation concerning the event in question.

The second stage; the estimations made in the first stage are summarized.

The third stage; the summary of the estimation is sent back to the persons making the estimation at the beginning of the process. The distribution and mean of the estimation values are included in the estimation summary. The persons who are extremely distant from the mean of the estimation values are asked to explain the reason of this.

The fourth stage; the persons who previously made estimation are asked to make new estimations by taking all values and explanations included in estimation summary. This process is continued until the result that will be the common evaluation of the group of experts is attained.

3- Social Benefit/Cost Analysis Approach

The benefit/cost analysis is the ratio of the present value of the incomes that will be provided by the investment within its economic life cycle to the present value of the investment and working expenses. For this, the activity incomes and expenses are determined separately. Though the benefits and costs are determined monetarily, there those that are not determined so. The benefits that are mostly not determined monetarily are the life and health conditions, beautifying the environmental esthetics and protection of the artistic structures and historical values provided by the project.

The total social cost of a project is the total of the cost of the resources such as the land used, raw materials, workmanship and technology and external costs imposed by this project on the society. The social benefit is the total of the advantages provided by the project outputs to its users and external benefits.

As the damage that will be caused by the project to the environment is also taken into account in the social F/M analysis, more rational decisions may be made concerning the selection of the location and technology of the project. However, as the determination of the monetary value of the damage is quite difficult, it is not so easy to apply this method.

It is more difficult to measure the social benefit of the project than to measure the economical benefits. In this system where the pricing system is important, the goods and services, more clearly, some benefits are monetarily evaluated or at least shadow prices are used, as there are difficulties in the division of the benefit created among the individuals.

It is not possible to say that the rules of market economy are sufficient to eliminate the externality in the economical sense.

CONCLUSION

The process of variation of the economical structure has disclosed the fact that "the environment has also a cost". The internalization of the externalities that is defined as that the damage caused on the environment has also a cost and its reflection to the

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price of the commodity produced has made it necessary to study the environment within the economical rules. Studying the environment within the economical rules is the general name of the evaluation of the environmental goods. While evaluating the environmental goods, various methods are being used. The most basic principle of these methods is "the polluter pays". It is estimated that this principle will provide maximum benefit in the protection of the resources. However, as the environmental goods are being evaluated, a more realistic result will be obtained by using the other methods along with this principle.

In addition, the economical value analysis of the environmental pollution should be made by taking its negative effects to the human health and the cost of the increasing health expenses into consideration. This analysis is the comparison of the social cost and social benefit made by taking the "optimum level of pollution" as the basis.

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