COST-BENEFIT ANALYSIS - BETWEEN OPPORTUNITY AND LIMITS

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Abstract
Organizations, public or private, are attracted by larger and more important investments, materialized in short or long term investment projects (with own or non-refundable financing). The opportunity and viability of these projects must still be considered in the design phase, before starting the actual investment, being considered viable in this sense the Cost-Benefit Analysis (CBA). The article presents the CBA as a procedure for evaluating the efficiency of the invested capital, in monetary values, in order to support the managerial decisions regarding the remuneration of the personnel, the acquisition of equipment, the accomplishment of arrangements and constructions, etc. Existing literature emphasizes the obvious opportunities and benefits of CBA (both for the beneficiary and for the investor), but avoids underlining its limitations by correlating the possibility of manipulating the information in favour of the beneficiary, avoiding highlighting the associated risks and errors.

Key words: *Cost-Benefit Analysis, efficiency, investment*

JEL Classification: *D6*

I. INTRODUCTION

We live in a world of consumptions, big investments of capital, trans-national transactions, non-refundable financing and international associations. In management practice, it is generally accepted that any decision of investment or financing should be economically justified and valued in money. Everything that cannot be expressed in value form is usually not taken into account. This provision applies to all decisions relating to all projects involving transport, housing and production infrastructure (not only), public or private, implying proper short or long term assessments.

Economic theory and practice has developed many approaches and methods for such assessments, involving multidisciplinary knowledge and practice (such as engineering, architecture, investments, taxation, accounting, etc.). In practice we can find different economic tools such as cost-benefit analysis and the cost-effectiveness method.

Cost-benefit analysis (CBA) method consists in comparing the cost of the total expected benefits from the project with the total costs of its implementation. The analysis has two objectives: 1) at the stage of project justification, it determines whether the benefits of the project exceed the costs (Hlaciuc, 1999) and, if exceed, by how much; 2) creates a cost basis for comparing different projects and justifying investments in them, both as a whole and for individual investors. A similar analysis is possible then and only if all the parameters involved can be represented in monetary terms. This is usually not possible when it comes to ethical, internal, temporary and aesthetic components.

Cost-effectiveness analysis (CEA) is used in the field of managerial decision-making mainly when the result cannot be monetized. That is, unlike CBA, it does not conduct a monetary valuation and is a broader analysis. It compares the relative costs and results (effects) of two or more business lines. Its purpose is to determine the ratio of project costs and its results (effectiveness), when the return on the project cannot be estimated in only one measurement system (usually in monetary terms). The project gain and costs can be expressed through a set of benefits, such as space, time, experience, increased attendance, etc.

II. CONCEPTUAL FRAME

Historically, the creation of the "cost-benefit" method is associated with the names of J. Dupuit, A. Wellington, A. Marshall and P. Samuelson.

Jules Dupuit (1844) published an article in which he proved the inconsistency of the method used at that time to determine the efficiency (usefulness) of business activities and rejected the idea of the usefulness of civil constructions (bridges, roads) as the sum of cash receipts from their operation. According to his theory, the value of public goods such as drinking water, roads, canals, and bridges is higher than this, and is not reflected in the price paid for them. Most people would be willing to pay more for these services than they actually pay. He later suggested that this value, called the consumer's surplus not received, when evaluating the feasibility of economic

activities, which became a new rule for calculating their effectiveness, which allowed us to take into account the utility for society, and not just their costs. The empirical basis of the CBA, established in the USA (and then grafted in Europe), came from the needs of engineering and technical practice and businesses seeking to obtain benefits (not only income or profit, or unchanged results) at the lowest cost.

In 1887, the American engineer Arthur M. Wellington suggested that the costs of constructing additional tracks, calculated using compound interest, be compared with the forecasted growth in freight traffic in each direction. It soon became clear that such problems arise everywhere in the analysis of any investment projects, and the engineering economy, ceasing to be of a sectoral nature, in the 20-30s of the 20th century finally formed as a science of choosing the best technical option for the ongoing project from an economic point of view.

The practical development of the CBA occurred after the adoption by the US Congress of the Flood Control Act of 1936, which required that the US Engineering Corps begin any project to improve the waterway system in cases where profit from the project exceeded the cost of this project. To evaluate the proposed federal waterway infrastructure projects, the U.S. Army Corps of Engineers initiated the use of CBA. The Flood Control Act of 1939 also introduced a norm according to which only projects with full benefits exceed estimated costs received funding. In fact, the adopted laws stimulated the development of a system of methods for measuring social benefits and costs. However, this system did not have widespread use until the 1950s, when economists found that the system of methods developed by military engineers was suitable for the economic analysis of any government investment. Economists have improved the methods developed by the Corps and since then CBA has been applied in most areas of government decision-making.

In 1958, Otto Ekstein substantiated the application of the theory of welfare economics as the basis of the CBA method and applied it to evaluate water development projects. In the 1960s, the method began to be applied to projects related to water quality, recreation and tourism, conservation of land resources and national parks. Later, this method was extended to state decisions in the field of healthcare, higher education and environmental protection. Other countries adopted the practice of using the CBA to justify public policy, including in the financial sphere, having developed appropriate guidelines (Canada, Australia) (Treasury Board of Canada, 2007).

Although some technical issues of cost-benefit analysis have not yet been fully resolved, a fundamental framework has been created. At present, cost-benefit analysis is widely used in transport planning, environmental policy, housing infrastructure and health. However, since its first use, it has changed significantly from a theoretical and practical point of view.

Now in the educational literature and applied developments other names of this methodology “project analysis”, “investment analysis” or “project cost analysis”, “financial model of investment project”, etc. are quite widely used (Boghean et. al, 2011). In general, the exact name has not been established. In the literature and applied work, there has been a conditional separation of the areas of application of CBA and project analysis.

At present, in Romania the CBA is used preparation and evaluation of the projects funded by the European Regional Development Fund, the Cohesion Fund, and the European Commission (Morosan-Danila, 2018), according to Government Decision no. 28 (of January 9, 2008) and Council Regulation (EC) No 1083/2006 (of 11 July 2006). The analysis process includes a monetary assessment of the initial contribution and possible costs in the process of project implementation and an assessment of the expected return on the project. The evaluation process consists of several stages, during each of which the costs and benefits for various population groups are carefully assessed, possible project outcomes that may entail additional losses or gains are considered.

III. THE RISKS ASSOCIATED WITH COST-BENEFIT ANALYSIS

The theoretical premises of the CBA required that all relevant effects for the efficiency assessment be quantified and expressed in monetary terms. The monetary expression of costs and benefits constitute the necessary conditions for the potential Pareto principle to be used, having as a net profit indicator. Although the analysis is extremely attractive, the analysis is limited by several factors. One of these is given by inadequate quantification mechanisms for public projects. For example, it is very difficult to compare the marginal social benefits and the marginal social costs, which appear at the cost of local social programs, with those of a national defence program. One problem with these limitations is actually the use of value for the calculation of externalities and intangible social benefits.

By definition, externalities are those effects for which there is no retail market (Kyfiak et. al., 2017). Not all the effects of producing a good can be found in the costs of production or in the selling price of it on the market, and the "accounting" costs are those incurred by the manufacturer, and, partially, by the state budget, in the case of direct or indirect subsidies (Boghean et. al., 2009).

In performing the qualitative CBA, the analyst will seek to quantify all the effects of a policy, to the extent possible. Finally, the analyst will resort to making qualitative assessments of costs and benefits. For example, at a tree planting project along a highway, we must hire a specialized company to deal with the

planting and then the maintenance of the trees, and the expenses incurred during this contract can be assessed directly in an amount of money, about here is the cost of the project. The benefits include, however, a number of effects that are difficult to be assessed monetary: landscape, air pollution, noise leveling in the vicinity of the highway, trees in summer will shade part of the highway, and in winter, will provide protection against the mist. All these benefits can be identified with the help of opinion polls conducted among drivers.

Another important issue that may arise in cost-benefit analysis is the uncertainty of future marginal social benefits and marginal social costs. Questions about the likelihood of future events should also be asked; models of the potential for future costs and benefits are often extremely important. Moreover, the difference in the possible proposals can lead to controversies regarding the social discount rate.

The limits of cost-benefit analysis take into account: costs and benefits and less policy objectives. The applicability of the analysis is small in the case of social policies. Sometimes there is insufficient information and statistical data at hand and implies the existence of a quite applied expertise. At the same time, the risk of manipulation may also appear, especially if it is used for projects with long-term and intangible qualitative benefits.

The risk analysis will also be taken into account in the study. The risk involves "the potential to achieve unintended consequences for human life, health, property or the environment" (Ghinea and Negoita, 2000):

- “individual risk”: the risk assumed by individuals on their own account (eg. the driver in unfavourable weather conditions);
- "risk of the society": the risk that concerns the society as a whole (eg. an event that causes the loss of several human lives: the disease of the mad cow);

Risk analysis is a technique of identifying and evaluating the factors that can affect the success of a public policy from the point of view of achieving its objectives (Zaiceanu et. al, 2015), Figure 1 presenting the stages of risks assessment and the methods used.

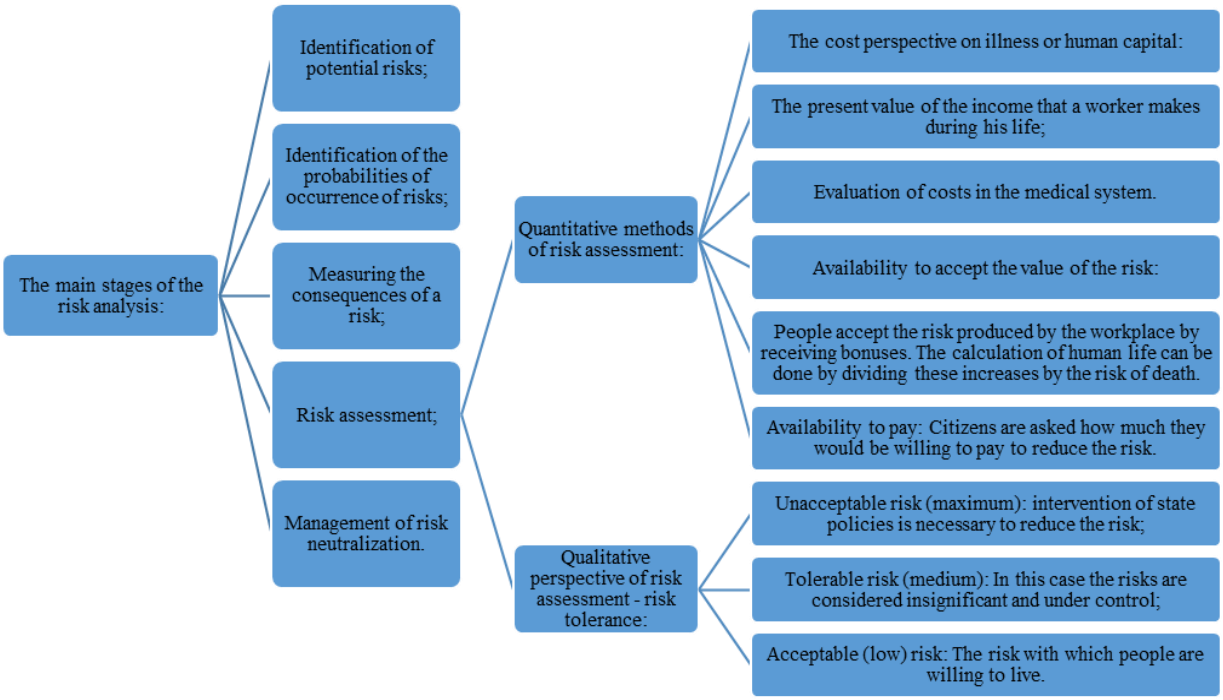

Figure 1 – Risk assessment in ABC

IV. LIMITS OF COST-BENEFIT ANALYSIS

There are several causes that can cause errors in CBAs. These errors can be the result of an approach through the bureaucratic "lens" by the manager. Sometimes errors appear as being committed in bad faith or they are strategic errors and they are determined by certain personal or organisational interests. There is a large amount of data that highlights that managers (and their teams) overestimate benefits and underestimate costs (Grigoras-Ichim and Morosan-Danila, 2016). This type of strategic mistake is widespread among managers and they do not seem to be limited to the public sector alone.

The errors that can occur in the cost-benefit analysis are categorised in 4, as presented in Figure 2 and detailed below.

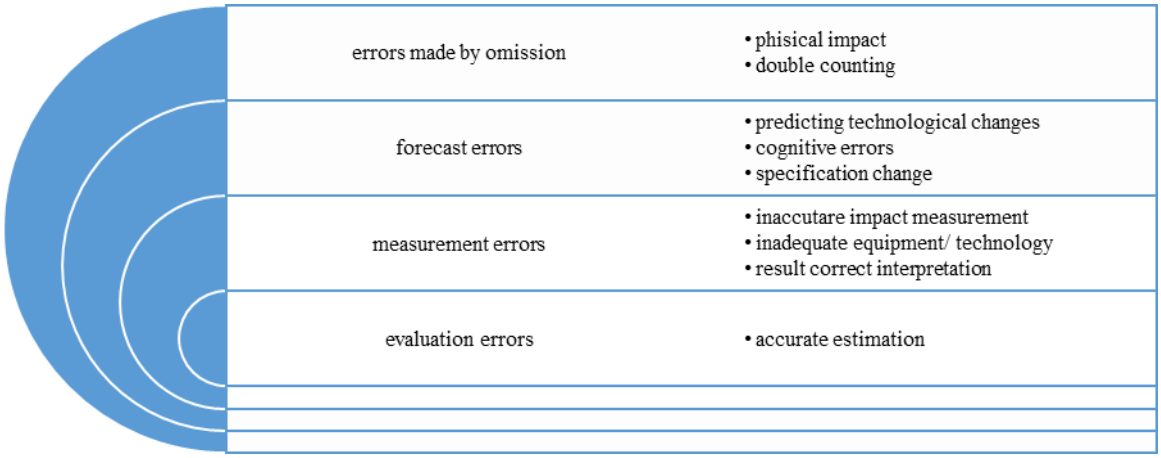

Figure 2 – Limits of ABC

Analysts can completely exclude a certain category of impacts when they consider that there is a very low probability that they will occur. This situation frequently occurs when it comes to an extremely technical project and when there are profound disagreements about physical impacts. Thus, there are still many uncertainties in the field of fundamental scientific knowledge regarding, for example, global warming. Analysts may find themselves caught in the middle of a "battle between experts" without knowing for sure what the impacts of different alternative policies are.

The opposite of the omission is the double counting. One way in which analysts take profits twice is to include both the benefits obtained on the primary market and those on a secondary market, for example, covering both the time saved and the price increases of the company. The benefits (or costs) achieved on the secondary markets should not be included, where the prices are equal to the marginal social costs.

Although the errors made by omission can be presented in a cost-benefit analysis, no matter when it is performed, we have every reason to expect their number to decrease as the project is implemented. There is no doubt that, as the project progresses, more and more data on the actual impact categories is accumulating. Therefore, it is very likely that errors by omission will be less common in later analyses.

In cost-benefit analysis, forecast errors can occur as a result of inherent difficulties (caused, for example, by difficulties in predicting technological changes), cognitive errors, modification of project specifications, as well as strategic reasons. Forecasts for periods longer than several months are often inaccurate, no matter what the context. In general, the difficulty of making accurate forecasts increases in cases where the projects are more complex, when they are unique, when there is a long time in the future and when they involve unknown correlations from cause to effect.

The impacts of certain government projects are relatively easy to predict, because their complexity is low, they are not unique and can be compared without difficulty with other previous projects; for example minor road improvements. In contrast, large projects, such as the Channel Tunnel (the tunnel between England and France), are complex, not easy to compare with other previous projects, and produce far-reaching impacts future.

Unknown correlations from cause to effect frequently occur when there is uncertainty in the level of fundamental scientific knowledge. They also appear when a government launches a new project, and analysts cannot know for sure how affected individuals will react. Existing data suggests that some individuals tend to react to new rules and regulations through "opposition behaviour", which results in a decrease in anticipated benefits of applying risk reduction regulations.

In the face of uncertainty, both the people affected by the respective policies and the analysts of those policies are potentially exposed to cognitive errors. Existing data suggests that people systematically underestimate "bad" events and have a low probability, but instead overestimate "good" events. Analysts and policymakers are not immune from such mistakes. Charles Schwenk (1984) provides a summary of the effects of cognitive errors on decision makers, which we can reasonably also consider as being in the field of forecasting. The main conclusion reached by this literature is that cognitive errors can lead analysts to serious and systematic errors of forecasting and evaluation, with a general tendency towards over optimism.

Forecast errors are also made due to changes made to the project specifications. Large and complex projects are always modified during their realization, often as a result of the irresistible adaptation of frontline employees to evolution of the project.

There is a tendency to consider that forecast errors do not appear in the ex post analyses, because all the impacts have already taken place up to that point. But the analyst still has to compare what really happened with what could have happened in the absence of the project, which is with the counterfactual. Although analysts might know what actually happened (what is likely to be measured), they need to make an assessment of what would have happened if the project had not been implemented.

There is a tendency to consider that, from the moment an impact occurred, all the uncertainties associated with that impact are removed. But in practice, it is very often the case that the impacts are inaccurately observed, recorded or interpreted. The size of this problem depends largely on the quality of the measuring equipment (technology) and the ability of the statistical or econometric methods to draw correct conclusions in the presence of measurement errors (methodological). However, very little attention has been paid to these problems in the literature on CBA because measurement errors are perceived as being of relatively small importance compared to other problems. Another reason would be that the current statistical methods for dealing with measurement errors are complex, impose very strict data conditions or require the existence of sound premises.

Accurate estimates of the social value (ie shadow prices) of some impacts are few in number. Until recently, even estimates of the value of such important categories as time saved and lives saved varied widely, many of the preliminary estimates being inaccurate. Evaluation problems may be more important in some contexts of CBA than others. For example, obtaining well-adapted shadow prices is particularly difficult in the case of projects in developing countries.

It is obvious that when it comes to the CBA, we talk more about welfare. The second best theory (what a good second chance) is another relevant piece when the analyst has to do with the cost-benefit method (Collins and Jones, 1998). Because the costs and benefits must be evaluated, it is necessary to use the prices for this. The number of errors is reduced to the extent that the cost-benefit analysis is performed later, but it will never reach zero. The cost-benefit analyses performed towards the end of a project are more accurate than those performed earlier, but the later studies also contain errors.

Cost-benefit analysis technicians are criticized about the weight of its application in making decisions regarding the environment - because the environment is the basis of human existence that cannot and should not be treated in monetary terms - another refers to the difficulty benefit evaluation.

V. CONCLUSION

CBA is a conceptual framework applied to any quantitative, systematic evaluation of a public or private project to determine whether or how much, this project is valuable from a public or social perspective. In this method, the benefit is, in fact, the advantage obtained on account of the provision of the public and private service, for which the project variants have been elaborated. In the early stages of a project there is considerable uncertainty about its effects and, therefore, about the social and corporate benefits of the project. Over time, these effects are better known, and the CBA subsequently realized can more accurately estimate the net benefits of the project.

A first stage in the elaboration of a cost benefit analysis is the establishment of a comprehensive list of all the costs and benefits associated with the project or decision: direct and indirect costs, costs associated with the investment risk, opportunity cost, etc. Benefits must include both direct and indirect income as well as intangible benefits, such as increased production due to improved quality of employees' work or increased sales due to growing demand from customers.

A conservative approach, with a conscious effort to avoid subjective tendencies when calculating estimates, is the most appropriate option when assigning value to both costs and benefits in order to perform a cost-benefit analysis.

The purpose of the CBA is to identify and quantify with all the possible impacts (financial, economic, social, and environmental), to determine the costs and benefits of the project, which, together, should say whether a project is worthwhile and advanced, whether or not it applies.

Risk analysis takes into account their uncertainties and their impact on both economic and financial results. To perform this sensitivity analysis, it is necessary to establish the critical variables. From the resulting uncertainties, the risk analysis can define the probability that the project will reach limit values for the economic and financial performance and to manage these risks in the analysis.

Finally, we can conclude that ACB is an important tool for the analysis of investment projects, provided that the objectivity and correctness of the analysis directions are maintained, both for the beneficiary and for the financing institution. It is recommended to collaborate with independent consultants for the realization of CBA, as well as updating the financial information within it, in order to ensure the accuracy and timeliness of the information, adapted to the stage of project implementation and the risks and unforeseen situations that have arisen.

VI. ACKNOWLEDGMENT

This work is supported by project POCU 125040, entitled "Development of the tertiary university education to support the economic growth - PROGRESSIO", co-financed by the European Social Fund under the Human Capital Operational Program 2014-2020

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