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Abstract

Ex-post evaluation of infrastructure projects is attempted by international and national organisations in different ways. Qualitative case studies, relying on documentary analysis, interviews and surveys, are regularly carried out, for example, by the European Commission, the World Bank, the European Investment Bank and Regional Development Banks. The aim of case studies is to provide an in-depth understanding of the project context and performance. The World Bank has also put in place a rating system to assess the performance of all investment operations financed, allowing for immediate comparability of results across sectors, countries, macro-regions, programmes and lending instruments. Some institutions and countries (e.g. the European Commission, the World Bank and the United Kingdom) make use of quantitative methods to measure infrastructure projects effects, like ex-post CBA. This method is mostly used to re-assess ex-ante appraisal results with more up-to-date data. An innovative way of integrating ex-post CBA and qualitative evidence is offered by the recent Commission's evaluation of major projects financed in the 1994-1999 period. Such research project allowed to study in a structured way not only project effects, but also determinant mechanisms of success or failure, leading to meaningful and generalised lessons about infrastructure project performance. The evaluation design and specificities characterising this approach are described and the main advantages highlighted.

JEL codes: B40, C81, H43

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1. Introduction

Investment projects can be defined as allocations of funds aimed at achieving a positive return to the society in terms of sustainable economic and social development. Most of long-term investment projects are about the creation of physical infrastructures in the transport, environment, energy and communication sectors, but they may also include immaterial activities, such as training, education and institutional building.

Ex-post evaluation of investment projects is attempted by international and national organisations in different ways. The World Bank regularly collects data and indicators about the performance of its portfolio of completed projects, and publishes an annual independent evaluation report. In the current World Bank approach, evaluators give scores to some dimensions of performance, and discuss regularities by cross-checking some project characteristics.

The European Commission, on the other hand, has made extensive use of qualitative case studies to explore the effects produced by samples of investment projects financed in the period 2000-2006. It has also been strengthening the use of ex-post Cost-Benefit Analysis (CBA) as a tool to reassess ex-ante appraisal analyses and verify the real economic returns of completed projects.

Recently the European Commission - DG Regional Policies (DG Regio) has carried out an ex-post evaluation that aims at learning lessons from in-depth case studies of a small number of infrastructure projects approved in the 1994-1999 programming period. This evaluation study attempted to detect not only the types and strengths of effects generated by projects, but also the mechanisms behind a project's success or failure. Impact dimensions which have been researched by the evaluators include a direct growth effect, shifts in the economic endogenous dynamics of growth, changes in institutional quality, social and territorial cohesion, effects on environment and, lastly, social happiness. Example of the factors that may explain project performance include the project appropriateness to the context, the forecasting capacity of investors and promoters, the governance structure, the project design and behavioural response to unexpected events.

This DG Regio ex-post evaluation has been an opportunity to test an innovative methodology that combines a qualitative evaluation of response mechanisms to shocks along the above mentioned impact dimensions, with a quantitative assessment based on ex-post CBA. Each of the ten case studies implemented is indeed structured as a project history, where the core of the exercise is an attempt to assess how the project is able now to respond to future challenges, based on how it has evolved in the last twenty years. As to the CBA exercise, it provides not only the monetary quantification of effects, but also a general framework of analysis to disentangle the most crucial aspects of the project's performance.

The objective of this paper is to review different approaches to the evaluation of the impact of investment projects, particularly infrastructure projects. The main focus is on the practices of the World Bank and the European Commission, but other references will also be considered. In what follows, Section 2 presents an overview of the main techniques of project ex-post evaluation, by focussing on the World Bank and European Commission's experience; Section 3 describes the conceptual framework which lays at the basis of the recent ex-post evaluation study of 1994-1999 investment projects and highlights the innovative characteristics of such evaluation methodology; finally, Section 4 concludes.

2. The traditional practice of infrastructure project evaluation

2.1 Overview of existing evaluation approaches

Infrastructure development is a priority on policy agendas in the EU and worldwide. Investment needs in basic infrastructure are very high, especially in lagging behind regions and countries. Governments at different levels (supra-national, national, regional and local) and international institutions invest a large share of their funds for infrastructure projects in transport, water supply, waste water and solid waste treatment, energy production and telecommunication. The OECD estimates that, in order to cope with global infrastructure investment needs to 2030, annual investments in transport, energy, water and telecommunications should be roughly equal to 2.5% of world Gross Domestic Product, i.e. approximately USD 53 trillion (OECD, 2007). Justification for public funding for infrastructure stems from the expectation that they foster economic growth, mainly by enhancing factor productivity, and promote convergence in income distribution and living standards (for a comprehensive review see Gramlich 1994 and Straub 2008).

Ex-post evaluation can be a factor playing a role in enhancing project effectiveness. Evaluation of activities and effects provides project promoters and civil society with better means for learning from past experience, improving service delivery, planning and allocating resources. As to the evaluation methodology, there is no a single approach that could give information on all the possible effects generated by infrastructural projects. Instead, different techniques are generally used by governments and organizations to evaluate the project effectiveness, i.e. the kind and strength of effects generated on the target population.

A popular qualitative evaluation approach relies on case studies, for which interviews are generally the main source of information. The case study method involves in-depth study of a phenomenon, like a project, but also programmes, policies, decision making processes, groups of people, etc. (according to the definition by EVALSED, 2009). They tend to be information rich, building up detailed and critical understanding of interactions and processes, paying also attention to the general context and stakeholders' interests and perspectives.

Case studies are a methodological tool for evaluating investment projects used by different institutions (for their use in the specific context of the evaluation of Structural Funds interventions, see Section 2.4). The European Investment Bank (EIB), for example, often makes use of the methodology of case studies to investigate about a selected range of co-financed infrastructure projects, such as the 13 case studies on solid waste management projects financed during the period 1984-2000 (EIB, 2002) or the case studies exploring the Bank's role in financing sustainable urban transport projects (EIB, 2009).

Regional Development Banks also use case studies to assess the impact of funded projects. The African Development Bank, for instance, has recently carried out an evaluation of its multinational operations, in order to evaluate to what extent they contribute to fostering regional integration in Africa. Face-to-face interviews, field visits and documentary analysis provided evidence to elaborate three case studies (about a road infrastructure, a natural gas project, and a major hydropower project, see AfDB, 2012).

The Operations Evaluation Department of the Asian Development Bank presented in 2008 five case studies on infrastructure projects in the energy, urban, agriculture and transport sectors in three countries (China, India and the Philippines). Case studies were aimed at providing an overview of the Involuntary Resettlement Safeguard measures in the Bank's operations. The analysis was generally based on interviews and field questionnaire surveys with project staff, officials of implementing agencies and beneficiaries, along with desk study of project documents and field assessment (ADB, 2006).

The same approach is followed by the Inter-American Development Bank, which regularly implements case studies to evaluate the impact of policies, programmes, initiatives, but also projects. In fact, case studies are considered a useful tool to generate knowledge, with the aim of extracting and organising key lessons for dissemination (IDB, 2012). Finally, the World Bank periodically carries out case studies of particular investment projects. In particular, the Bank uses case studies for in-depth analysis of the result of a project or group of projects or to illustrate given points (Morra and Friedlanders, 1999). For example, as far as infrastructures are concerned, the audits of two water projects in Malawi (World Bank, 1997a), five transportation projects in Thailand (World Bank, 1997b) and the study of paddy irrigation and water management in South-East Asia (Rice, 1997) are based on case studies (the Bank's overall methodology of evaluation is more extensively analysed in the next Section).

Among quantitative evaluation approaches at project level, Cost-Benefit Analysis and, to a minor extent, Cost-Effectiveness Analysis are the most used. Other approaches which may be used are macroeconomic simulation models (such as the Computable General Equilibrium modelling¹) and econometric techniques; however these are not discussed here as they are better suited to measuring the impact of an entire programme of investment, but are less applicable at local/project level.

Cost-Benefit Analysis (CBA) consists in assessing whether benefits accrued from project implementation are in excess of the estimated socio-economic costs, i.e. if the project represents a net benefit to the whole society. Despite CBA being normally used ex-ante to assess if a project is worthwhile of public financing, CBA is also performed by certain institutions (e.g. the World Bank and the European Commission) after project completion to re-appraise the project on the basis of updated information and data. Even the UK government, in its Green Book (HM Treasury, 2003), suggests the development of ex-post appraisal procedures as essential tool to improve appraisal process in due course. The key strength of CBA is that it produces information of the project's net contribution to the society, synthesised into simple indicators, such as the Net Present Value (NPV), the Internal Rate of Return and the Benefit/Cost Ratio. It can incorporate into the analysis non-financial effects, such as externalities, other indirect effects and market distortions, by converting the observed prices and tariffs into shadow prices that better reflect the social opportunity cost of the good, according to the Little and Mirrlees approach (1974). Equity issues can be incorporated into the analysis through the calculation of individual NPVs for different categories of stakeholders, with the sum of these individual NPVs equal to the aggregate socio-economic NPV for the project. Alternatively, welfare weights could be plugged into the shadow prices, to account for utility functions which differ across specific social or geographical groups. By reducing all costs and benefits into monetary terms, CBA allows policy makers to compare projects across sectors and time. A key difficulty is that some costs and benefits, including many that fall into the environmental and social categories, are difficult if not impossible to reduce to monetary values, especially where they relate to human life and health.

To overcome such difficulty, evaluators may decide to use another quantitative evaluation technique: the Cost-Effectiveness Analysis (CEA), which is concerned with identifying the lowest cost method of achieving a policy goal. CEA is typically used in sectors where monetary evaluation of benefits is seen as especially difficult or problematic, or the benefits are seen as self-evident and widely accepted. The prime example is probably in the health sphere, where there is often a reluctance to place monetary values on years of life. Output of the CEA is a ratio where the denominator is a gain and the numerator is the cost associated with it.

The practice of combining qualitative and quantitative techniques, in order to take advantage of the specific strengths of each evaluation methods, is not uncommon. Actually, Cost-Benefit Analysis is usually complemented by general qualitative information about the context and unquantifiable effects that are not included in the analysis. The main quali-quantitative approaches used by two institutions deeply involved in financing infrastructure investment and used to carry out ex-post evaluation activities, i.e. the World Bank and the European Commission, are described in the following Section.

2.2 Project ex-post evaluation at the World Bank

The World Bank has been the most important international institution to promote the practice of professional project appraisal and re-appraisal for many decades (as recognised, for instance, by Jenkins, 1997). The Bank currently requires both ex-ante and ex-post evaluation of investment operations in all sectors, mainly based on the CBA methodology developed by Little and Mirrlees (1974), which involves taking border prices for traded goods as proxies of their shadow prices, while long-run marginal costs for non-traded goods. The scope for using ex-post CBA is to re-assess the ex-ante results with updated data. Some econometrics have also been tried, based on standard CBA indicators and aimed at analysing variations of the rates of returns across projects, sectors and time, as well as the wedge between the economic and financial rates of return, and the gap between the ex-ante and the re-estimated rates of return (Pohl and Mihaljek, 1992 and, more recently, Del Bo and Florio, 2010). Data about the World Bank's rates of return were extracted from the large database built by the Bank's Operations Evaluation Department, comprising 2,147 projects from 1974 to 1997. The authors find that the average gap between ex-ante and ex-post rates of return is mainly due to forecasting errors. Such result supports the importance of implementing ex-post CBA, in which forecasts are partly substituted by actual data, so as to reduce the degree of uncertainty about the expected rates of returns and net present values.

¹ Computable General Equilibrium consists of a very large set of simultaneous equations reflecting the behaviour of economic agents (based on microeconomic principles such as cost minimisation and utility maximisation) and capturing the inter-sector relationships in the economy, in particular elasticity values, which reflect how economic agents react to changes. The outputs of the model are usually the main macroeconomic indicators such as GDP, inflation, unemployment, wages, taxes, etc.

The use of Cost-Benefit Analysis helped establish the World Bank's reputation as a knowledge bank and served to demonstrate its commitment to rigorously measuring results and ensuring accountability to taxpayers (World Bank, 2010a). However, in practice, the CBA exercises implemented by the World Bank tend to deviate from the fundamentals of CBA theory (Little and Mirrlees, 1994; Devarajan *et al.*, 1995): shadow pricing is limited to some border pricing for crucial inputs and outputs and risk analysis is not always carried out. An external observer, Payer C. (1982), in its well documented study (and radical critique) of the Bank's activity has written:

"In practice [...] social cost-benefit analysis looks quite different than it does in academic circles. It turns out that the methodology is simply too complicated for use in the field, and "shortcuts all around" is the rule. The choice of shadow prices, wages, and interest rates, for example is largely arbitrary. The use of distributional weights is in practice extremely rare. And there is virtually no end to the calculations of externalities, and therefore an enormous range of choice of what to include in the calculations and what to ignore. With a system of shadow prices, anything can be justified" (pages 80-81).

During the Nineties, the Bank admitted the difficulties in quantifying all the benefits deriving from projects and in computing the shadow prices for key production factors and some outputs. It also underlined that cost-benefit analysis of completed project is hampered by the failure to collect relevant data, particularly for low-performing projects, and highlighted a general decline in all sectors in the application of such analysis: the percentage of Bank investment projects with estimates of the economic rates of return in the Final Completion Report dropped from 70% in the late Seventies to roughly 30% in 2008 (World Bank, 2010a).

The Bank has discussed about how to improve the economic analysis of its projects. The economic rate of return approach will still be applied for certain projects, particularly infrastructures, while it is recognised that CBA may not be particularly suited for evaluating the development impact of investment projects to build capacities and strengthen institutions. Appropriate staff incentives, standardisation of CBA presentations and improved clarity among staff on the use of economic analysis tools for CBA are some of the measures envisaged to revive the use of CBA in the World Bank (World Bank, 2010b).

In parallel, a qualitative assessment of project performance, aiming at complementing the quantitative ex-post CBA results, has been developed since the Nineties and was formalised in 2002 (World Bank, 2002). Such assessment involves both investment operations (which account for 75 to 80% of the Bank's portfolio) and development policy operations, i.e. short-term loans to address immediate financing needs. Performance ratings are provided by the Bank's operational staff and reported in the Implementation Completion and Results report, prepared within six months of the final payment. Ratings are given to evaluate (i) how achieved outcomes of a project compare against those set ex-ante, (ii) sustainability of results and (iii) the impact of institutional development. Project ratings at project level are qualitative and range from highly satisfactory to highly unsatisfactory projects, ensuring comparability of results and aggregation by sector, country, programme, lending instrument and macro-region. Self-evaluations produced by the Bank's regional staff are then reviewed and validated by the Independent Evaluation Group (IEG) and presented in the Annual Reviews of Development Effectiveness².

A sample of projects is identified and selected from all the completed ones (usually one out of four completed projects), for further analysis and learning. For these projects the IEG carries out a more detailed Project Performance Assessment (PPA) and some qualitative case studies (see previous Section). PPA reports and case studies may be then used to feed Country Assistance Evaluations (approximately ten per year), Sector and Thematic Reviews (about six per year), Process Reviews (two or three per year) examining the overall efficiency, consistency and effectiveness of different on-going activities, as well as Impact Evaluations at Programme level (World Bank – Independent Evaluation Group website).

In recent years, the Bank has attempted to make the rating system more meaningful (i.e. relying on more relevant indicators) and accurate³. Moreover, in 2011 the Bank developed a corporate scorecard, i.e. an annual document tracking elements of development results and the Bank's own performance. The scorecard is built starting from the project performance ratings, which are aggregated into four groups in order to achieve a higher-level view, intended to provide information not on specific projects, but on the whole corporate results. The four groups of indicators are related to i) the development context, ii) country results supported by the Bank,

² The Annual Reviews of Development Effectiveness reveal that the Bank's self-assessments of project performance are in general more optimistic than the IEG ratings. In the last years, the average share of projects rated at least moderately satisfactory is between 75% and 85% (World Bank, 2008). Factors which may have influenced weak project outcomes are, for example, poor or too complex project design, over ambition and delays in implementation.

³ More than 80% of Implementation Completion and Result Reports approved in the period 1997-2006 highlighted lack of clear definition of some indicators (World Bank, 2009)

(iii) development outcomes and operational effectiveness, and iv) organisational effectiveness and modernisation (World Bank, 2011).

The current system can be considered relevant and effective for at least two reasons. First, the rating system applies to all projects, including investment operations and development policy operations, financed by the two main development agencies of the World Bank – the International Bank for Reconstruction and Development and the International Development Association. This allows for an annual overview of the overall effectiveness of the Bank's operations. Second, the scale of project rates allows comparability and aggregation of results. This guarantees the possibility of analysing the Bank's performance from different perspectives. Yet, some weaknesses of the current Bank's evaluation system can also be identified. A certain level of discretion comes into play in the project rating exercise and there is a mismatch between the rates assigned by the Bank (self-evaluations) and those revised by the IEG, with the former being generally more optimistic than the latter (World Bank, 2008)⁴.

Such evaluation method does not provide indication about the processes and factors that led to certain results. As a matter of fact, project rates are an intuitive and simple way to show the Bank's performance by rating projects on the basis of the extent to which operations' objectives have been achieved. However, the endogenous and exogenous factors that may affect the project performance vary considerably case by case. Trying to synthesise the performance results of a project with an ordinal rate assessing to what extent ex-post results match ex-ante expectations prevents from deriving lessons on the mechanisms determining the project success (European Parliament, 2011).

2.3 The Hirschman's approach to evaluating World Bank's projects

Regarding the analysis of mechanisms behind certain project effects, it is interesting to highlight that a few decades ago the World Bank had the opportunity to learn from a completely different evaluation approach, presented by Alfred Hirschman, in his influential book "Development Project Observed" (1967). The author reports about the results of eleven infrastructure investment projects financed by the World Bank all over the planet. Hirschman opted for thoroughly studying a selected number of projects, aiming not at verifying whether ex-ante expected results had been achieved, but rather at analysing the causality chains of effects and at identifying the specific factors which could determine the success or the failure of a major project.

In this exercise of ex-post evaluation of individual projects, Hirschman pointed to the different sources of uncertainty challenging the project performance during its lifetime (ranging from technological problems to religious aspects), and on the mechanisms that motivate the key actors to undertake achievement-oriented behaviours. From the case studies, Hirschman extracted key ideas for generalised policy lessons and operational recommendations, which go beyond the projects observed, thus indicating the possibility of generalising from single case studies (in line with Flyvberg, 2006). In particular, he unveiled the importance of aspects that cannot be straightforwardly treated in technical or purely quantitative terms, which are sometimes the determinants of success and failures of a project. Among these, is the capacity of putting in place creative solutions and unplanned resources and energies to promptly adjust to unpredicted events and to manage the sources of uncertainty.

While the evaluation technique currently used by the World Bank applies to all projects financed and leads to a composite and comparable score, Hirschman's in-depth case studies provided a much wider set of information on the impact of projects using a narrative form. Actually, Hirschman kept in high consideration the value of telling a story:

"While visiting the projects and talking to their administrators and other interested parties, I collected so many fascinating stories that storytelling came at time to overshadow the analysis" (p. viii).

It is clear that each of the two described qualitative approaches to evaluate the Bank's investment projects – Hirschman's case studies and the current rating system – has different perspectives, and meets specific evaluation objectives. In one case, composite rates can be assigned to all financed projects on an annual basis to give a snapshot of the degree of effectiveness achieved by the Bank's operations. In the other case, case studies exploring all the project's effects and determinants of performance need more time to be finalised and can be performed only for a limited number of projects. Actually, Hirschman took several years to study the history and performance of eleven projects and to derive generalised lessons. As a matter of fact, the World Bank currently uses case studies on selected projects to complement the rating system, although the focus is always on performance and not on the mechanisms of success, in a more Hirschmanian style.

⁴ The disconnect between the Bank's self rating and the IEG rating is approximately 8%, but it significantly increased to 17% in 2007 (World Bank, 2008).

2.4 Project ex-post evaluation at the European Commission

The Commission has been using diversified evaluation techniques for projects, both of qualitative and quantitative type. As anticipated in Section 2.1, case studies are extensively implemented in the context of Structural Funds evaluations. Catalano and Pellegrin (2010) highlight the important advantage of case studies.⁵ As a method of holistic analysis applied to complex situations, case studies are particularly appropriate for dealing with the complexity characterising Structural Funds interventions, which take place in European regions with very distinct socio-economic and historical features. The use of multiple case studies, covering a certain number of projects at the same time, make possible to carry out context-dependent analyses in the absence (or imperfect availability) of hard and exhaustive data.

There are different examples of purely qualitative case studies in the context of the European Commission project evaluation. In the case of the ex-post evaluation of projects and activities under the LIFE programme⁶ (COWI, 2009, on behalf of DG Environment), effects of LIFE projects financed between 1996 and 2006 were assessed through an electronic survey (gathering information on more than three hundred projects), on-site visits (for more than one hundred projects) and desk review of project documents. The evaluation covered both infrastructure projects, such as an integrated recycling plant for agricultural plastics or a solid waste treatment and valorisation plant with energy recovery, but also activities involving the development of environmental legislative measures or trainings for natural conservation. Both short-term results and long-term impact indicators, for already completed projects (1742 of the 2033 projects analysed), have been considered and evaluation questions related to effectiveness and efficiency of selected projects were addressed through in-depth project, country and thematic case studies.

The ex-post evaluation of the URBAN Community Initiative, covering the 2000-2006 programming period (ECOTEC, 2010), despite of being mainly carried out at programme level, includes ten detailed case studies for 'good practice' projects, selected to be representative of all the programmes. These projects included infrastructure projects, such as an urban by-pass and a theme park and museum in Italy. The main data sources consisted of interviews, desk research and on-site visits.

The analysis of ERDF co-financed innovative projects (Technopolis, 2008) envisaged the implementation of 60 project case studies, some of them concerning innovative infrastructure projects, such as the construction of scientific parks or renewable energies centres, accompanied by an horizontal analysis through themes such as clusters, project partnerships, process of design and planning, etc. Innovative elements of both the project process and results were captured thanks to extensive fieldwork and direct contacts with project stakeholders, which helped to gain hands-on experiences. As stated in the Final Report of the evaluation study, *"The accumulated evidence from the cases provides a complementary contribution to more traditional evaluation methods [i.e. documentary analysis] to a better understanding of the link between the strategic policy design and project implementation on the ground"*.

In recent years, the European Commission has strengthened the use of ex-post CBA within project case studies as a method to provide measurement of projects' effects. The primary application of CBA in ex-post evaluation has been to reassess the results estimated during the appraisal process. In other terms, selected projects financed by EU funds in the transport, environment and technology sectors underwent a re-appraisal just after their completion to compare the actual impacts with the forecasted ones or the achievements with the initial objectives, thus giving a measure of the actual utility of the project. The EVA-TREN research project (2007) performed options, demand, financial, economic, environmental and uncertainties analyses for eleven investment projects in the field of transport and energy networks. CBA has been the main evaluation approach, which allowed to compare forecasts and actual costs for projects, thus showing where cost overruns occurred and which were the sources of errors in the ex-ante analysis.

Another study making use of CBA approach is the ex-post evaluation of Cohesion Policy intervention financed by the Cohesion Fund in the 2000-2006 programming period in EU and former ISPA countries (AECOM, 2011a and COWI *et al.* 2011). CBA results of ten selected transport (rail and road) and ten environmental projects (water, waste water and waste management,) have been re-appraised and compared to ex-ante results. The outcome consisted of conclusions about the ability, quality and consistency of ex-ante CBA. Some years before, also the ex-post evaluation of a sample of infrastructure projects co-financed by the Cohesion Fund in the period 1993-2002 (ECORYS, 2005) implemented in-depth project review to evaluate the efficiency, effectiveness management and impact of 60 selected projects divided over the transport and environment sectors. Despite the many problems with data

⁵ See http://ec.europa.eu/regional_policy/information/evaluations/archives_2000_2006_en.cfm

⁶ The LIFE programme is the EU financial instrument supporting environmental and nature conservation projects through the EU Member States and some candidate and neighbouring countries. Since 1992, LIFE has co-financed more than 3,000 projects (source: European Commission website <http://ec.europa.eu/environment/life/>).

availability and consistency of data, the study Team reviewed many ex-ante CBAs in view of the ex-post information gathered. For the majority of the projects the Economic Rates of Returns have been re-computed in order to show the actual socio-economic impact of projects analysed and their deviation as respect to the ex-ante forecasts.

To sum up, project evaluation in the form of qualitative case studies is performed on a sample basis and ex-post CBA is increasingly used by the European Commission. So far, the main scope for using ex-post CBA has been to reassess ex-ante results so as to provide quantitative and present indications of social costs and benefits of concluded projects.

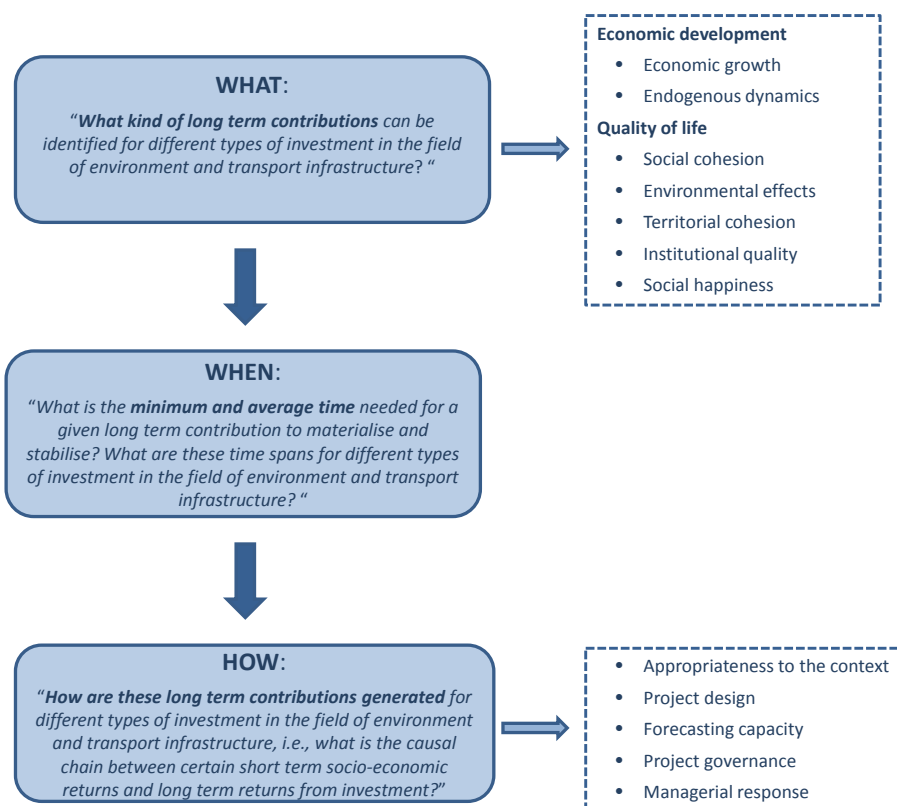
An innovative way of using CBA in ex-post evaluation is offered by the recent evaluation of ten ERDF and Cohesion Fund major projects financed in the 1994-1999 period (CSIL, 2012). In such study, the CBA exercise and qualitative evidence have been combined and structured in such way to provide more detailed and intensive information about projects' impact and mechanisms of success, in line with Hirschman's approach (see Section 2.3). The adopted methodology is discussed in the following Section.

3. A different example of ex-post evaluation methodology

3.1 Evaluation design

Between 2011 and 2012 CSIL - Centre for Industrial Studies has been carried out the evaluation of ten selected major infrastructures in the transport and environment sector financed by the European Commission in the 1994-1999 programming period. The study's objective was to answer three evaluation questions concerning the kind of effects generated by projects (i.e. the 'What' dimension of analysis), the timing of effects generation and stabilisation (the 'When' dimension) and the causality chain that led to certain effects (the 'How' dimension).

Figure 1: Conceptual framework of the evaluation study



Source: CSIL (2012)

An extensive review of the theoretical and empirical literature in the economic and social science spheres has been carried out in order to identify the full list of possible effects expected to be produced by infrastructure projects (CSIL, 2012). The evaluation team identified two groups of effects, one related to economic development and one to overall quality of life. On the one hand, effects on economic growth and endogenous dynamics of growth (such as human capital, technological progress and organisational arrangements) have been included within the first category. On the other hand, the second group encompasses effects on social and territorial cohesion, environment, institutional quality and social happiness. The latter has to do with the project's influence on those variables which may affect the subjective perception of people's wellbeing, such as psychology, family context, religion and cultural traits. Table 1 below synthetically reviews the possible effects identified, and proposes a checklist of question to address in order to explore these effects.

Table 1: Taxonomy of long term effects

Effects	Definition	Checklist
Economic development		
Direct economic growth	Following the traditional growth theory, both public and private investment contribute to increasing the stock of capital and thus economic growth. The direct contribution of a project to economic growth, in terms not only of real growth of GDP, but also, more generally, on economic welfare is discussed within this category of effect.	Did the project have effects on the endowment of labour or capital production factors? Did it contribute to employment creation? Did it attract new investments? Did it create new business opportunities? Did it produce time savings for business trips? Did it produce decreases in travel costs?
Endogenous dynamics	Endogenous dynamics comprise all the factors that have an indirect effect on economic growth, by improving the productivity of inputs: the increase of the stock of competences and knowledge of human capital, the introduction of a more advanced technology and changes in the organisational model of economic actors, making them more efficient, are analysed insofar they contribute to increasing the production function.	Did the project contribute to the improvement of the productivity of the economic system? Have social behaviours changed as a result of the project? Did the project provide new/improved skills, R&D investment, organisational changes that translated into an increase in labour productivity?
Quality of life		
Social cohesion	Public investment can affect social cohesion, by minimising disparities, avoiding social marginalisation and reducing income inequalities across different socio-economic, gender or ethnic groups.	Did the project promote social inclusion? Did it improve the conditions of specific segments of the population (e.g. elderly, migrants)? Did it improve the affordability of services?
Environmental sustainability	Polluting emissions, biodiversity loss and depletion of natural resources caused by large infrastructural projects can affect social wellbeing of both the present and future generations.	Did the project improve the quality of the natural environment? Did it alter wildlife habitats? Did it affect the ecosystem? Were there any environmental issues related to project implementation?
Territorial cohesion	The project can contribute to reducing welfare disparities caused by unequal distribution of resources and opportunities among regions and their population. The focus, in particular, is on core-periphery and urban/rural differences.	Did the project improve the territorial cohesion of the region/country? Did it play any role in urban-rural or core/periphery or cross-border dynamics? Did it expand the territorial coverage of the delivery of a basic service?
Institutional learning	Investment projects can bring wide spill-over effects to the quality of Public Administration and other institutions at national, regional or local level. Institutional quality is strongly related to economic growth, but it can also affect the quality of life of people, because of the intrinsic value that individuals can attribute to a well-ordered society.	Did the project induce any institutional learning at regional administrative level? Did it raise political awareness regarding a specific theme? Did it have effects on the level of corruption?
Social happiness	This category encompasses all those variables which may affect the subjective perception of people's wellbeing, and have to do with their psychology, family context, religion and cultural traits.	Are the project beneficiaries overall satisfied with the project's implementation and outcomes? Did the project have any effect on the perception of quality of life? Did it affect the sense of security of the target population?

Source: CSIL (2012)

In order to answer the third evaluation question related to the 'How' dimension, the Team identified five stylised possible determinants of project outcomes, again based on empirical evidence and inspired by the literature review, particularly by Hirschman (1967). The project appropriateness to its context, its technical design, forecasting capacity of project promoters, project governance and managerial response of actors and professionals in reaction to unforeseen events are considered factors that may determine certain project outcomes. Each factor may play a role also in combination with other factors through patterns which may be project-specific. Table 2 below gives details on the five categories of determinants and the associated working hypothesis – a checklist of questions to determine the validity and the strength of the working hypotheses is included.

A combination of qualitative and quantitative evaluation techniques has been put in place to answer the above mentioned evaluation questions and to detect and analyse the different kinds of effects and determinants of project performance. In particular, the Team combined the ex-post CBA methodology with direct interviews and observation.

Table 2: Key determinants of project outcomes

Determinant	Definition	Working Hypothesis	Questions to be answered
Appropriateness to the context	Includes the consideration of institutional, cultural, social and economic environment into which the project is inserted.	Context traits can be more or less favourable for project performance and deserve early and careful consideration about which to take or to make. The terminology of context traits that can be either 'taken' (that is, accepted, as they are considered unchangeable) or 'made' (by changing existing or creating new traits) is drawn from Hirschman (1967).	Has the (political, cultural, socio-economic, institutional, regulatory) context played a role in influencing the attainment of long-term effects? Were there any political, social, cultural, economic, regulatory, or institutional constraints to project implementation and performance? Was the project 'trait taking' or 'trait making' in its nature? If it was intended to be trait making, did it succeed?
Project design	Refers to the technical capacity to design the infrastructure project and to select the best project option.	The technical and engineering capacity to design an infrastructure and to provide the appropriate mechanism for its financial sustainability should be sufficiently disciplined to reduce future risks: at the same time it should leave some degrees of 'latitude' to enable adjustments for unforeseen circumstances. Following Hirschman, latitude is the characteristic of a project that permits the project planner and operator to mould it, or to let it 'slip', in one direction or another. Some projects are so structured that latitude is severely restricted or completely absent: in these cases, the project is considered highly 'disciplined'.	To what extent and in what way did the technical, structural and financial features of the project influence its performance? Did the option selection process lead to the implementation of the most promising project idea? Was project design capacity a relevant factor in determining the observed ex-post performance of the project? Was the project design flexible enough to be adjusted, if needed, to external and unexpected constraints?
Forecasting capacity	Relates to the feasibility and capacity to predict future variables, such as the demand level.	A good initial investment in building the forecasting capacity does not eliminate risks, but it increases the knowledge of the context, improves the project design and optimises the distribution of responsibilities without lowering the commitment to performance.	Were the ex-ante forecasts based on a sound methodology and a comprehensive set of information? Were some important factors not sufficiently considered ex-ante? Was the forecasting capacity a relevant factor in determining the observed ex-post performance of the project?
Project governance	Concerns the number and type of stakeholders involved throughout the project cycle and how responsibilities are attributed and shared.	High stakeholder involvement, well-defined roles and responsibilities and incentive mechanisms require commitment of resources and increase the complexity of the decision-making process, which may be subject to particular pressures, but they can favour the project performance and its sustainability over time. Within this determinant, the role played by the European Commission in the project has also been analysed.	What are the interests and motives of different actors and incentives for decision-making? How did they change over the time-span considered? Was the ownership of the project clearly identified? Did contractual arrangements improve the co-ordination of different stakeholders towards achievement-oriented results? Was project visibility a relevant political incentive to foster proper project implementation? Was the project subject to political or other forms of pressure?
Behavioural response	Defined as the managerial and professional ability to react to unforeseen events.	Unpredicted events that occur and undermine the sustainability of the project and its capacity to lead to expected benefits can be overcome by prompt and adequate response from the decision-makers and project managers, driven either by professionalism and experience or by creativity and imagination.	How did the project react to exogenous, unpredictable, events? What remedial actions were put in place? What mechanisms were used to incentivise proactive responses? Why were these events unexpected? Was it due to their purely exogenous and ex-ante unpredictable nature? Or, was it due to poor planning capacity?

Source: CSIL (2012)

3.2 Specificities of the evaluation approach

The hybrid nature of the methodology – qualitative and quantitative – cannot be considered innovative *per se*. Actually, all CBA exercises, to a certain extent, complement quantitative data with more qualitative evidence about the project context and unquantifiable effects. Nevertheless, this evaluation exercise can be considered innovative from other points of view.

First, thanks to the particular timeframe of the evaluation, which is carried out on projects financed almost twenty years ago, the Team took the advantage of the possibility to observe the mechanisms that influenced the projects over their past histories and, in this way, to analyse the key determinants of project long-term outcomes. Hence, the evaluator had a privileged position which allowed him/her to look back in the past, dig in the project's history and highlight not only whether any diversion from ex-ante plans occurred, but also why. Such an emphasis on exploring the causality chains of effects is one of the main factors that distinguishes this evaluation exercise from others recent examples of evaluation. In fact, this study can be considered more in line with Hirschman's approach to project evaluation, rather than with current evaluation practices. In the World Bank case, in particular, although the scoreboard gives indications about the development context in which projects are implemented, the quality of design for

investment operations and the kind of skills involved in the project implementation, no attempt is made to detect the influence of such factors on project performance.

There have been some studies that attempted to explore the causality link between specific factors, such as the strategic policy design and project implementation in the European Commission's evaluation of innovative projects (Technopolis, 2008). Yet, so far no evaluation study has specifically tried to discover, in a structured way, the different determinants of project performance.

Second, the evaluation approach tested by CSIL offers a unique combination of different perspectives of analysis, all simultaneously integrated. The distinction between economic and quality of life effects required to combine the perspectives of economics with the broader frame of social sciences, in order to build a comprehensive picture of the project's long-term impact. There are various strands of the literature analysing to what extent and under which conditions infrastructural projects can trigger economic development. It is however acknowledged that major infrastructures may affect quality of life by means of other factors, which do not have a purely economic nature: people's level of satisfaction and subjective perceptions about social reality are elements which can explain the different dimensions of project outcomes, but which are generally better explored by the social sciences and cannot be easily captured by economic models.

Moreover, even if the unit of analysis was individual projects, their geographical scope has ranged from the local to the national and even supra-national level⁷. This made necessary to resort to suitable mix of micro and macro-level perspectives of analysis, in order to capture most of the direct, indirect and wider effects of the project and its interaction with other sectors and geographical areas. On the micro level of analysis, the focus was on the long-term contributions to welfare brought by the infrastructural project itself. On the macro level, following general equilibrium perspective, the wider effects generated by the project on external systems, areas and sectors have also been considered: in order to have a complete picture in terms of welfare generated, most relevant effects in other secondary markets have been included, taking into account complementarities and substitution effects.

Third, another peculiarity of this evaluation study is the way how ex-post CBA was used and the kind of information CBA can gather for projects evaluation. Unlike the World Bank approach and previous Commission's studies, ex-post CBA outputs has not been used merely to show any deviations from the values foreseen in the ex-ante CBA. Instead, the most important contribution of the CBA exercise has been to provide a framework of analysis to disentangle the crucial aspects of the projects' ex-post performance and final outcome and to provide quantification or indications about some of the long-term effects produced by the projects. The identification of objectives, the alternative options analysis, the demand analysis, the forecasting and measure of financial outflows and inflows and of costs and benefits on social welfare were meant to stimulate the evaluator to reflect on the rationale and foundations behind the investment decision, as well the implementation problems that may have been embedded therein. Furthermore, any deviation from expected values stimulated research into the reasons for this, in order to answer the evaluation questions about the suitability of the forecasting capacity and the promptness and effectiveness of managerial response. It has also to be pointed out that the ex-post CBAs implemented often differ very much from ex-ante analyses, with new costs and benefits identified.

Another reason why CBA proved to be an appropriate analytical approach for the ex-post evaluation is that, by including in the model the monetary value of externalities, it gave the opportunity to analyse more deeply the existence of unintended effects and to reflect on the sustainability of the economic development and the existence of other non-monetary externalities outside the scope of the CBA. Similarly, the use of stated preferences to capture the consumer's perceptions of the project's net benefits, drew the evaluator's attention to the possibility that not all of the effects could be totally or correctly perceived by people and that additional factors may influence 'Social happiness'.

CBA results have been complemented by a qualitative assessment of projects' long-term effects and of the factors influencing the causal chains leading to those effects. Personal interviews with key actors were considered relevant to understand the project 'history', starting from its design and financing decision to the present and future developments. Integration of quantitative and qualitative techniques allowed mitigating the limits of relying only on CBA, such as the difficulty in attributing a monetary value to certain social benefits and costs, or only on qualitative techniques, such as the lack of reliability of individuals' perceptions and the missed quantification of costs and benefits. Moreover, it is likely that purely quantitative or purely qualitative analysis would have not fully answer the study's evaluation questions: qualitative techniques are probably better at determining why certain effects are generated, along what dimensions, and identifying the various "shades of grey" between the two extremes of a project's success or failure. At the same time, quantitative data can provide an important support to test and validate certain findings derived from

⁷ In case, for example of Trans-European Network (TEN) transport projects with cross-border aspects.

interviews. Finally, qualitative methods could help to expand the scope of the CBA, which is mainly focused on the micro (project) level, and to detect the wider effects on other sectors, markets and areas not directly influenced by the CBA.

4. Conclusions

In this paper we reviewed the methodologies adopted by different institutions to assess the impact of financed infrastructure projects. The European Investment Bank and Regional Development Banks are used to implement qualitative case studies to investigate project effects. Some institutions (the World Bank and the European Commission) and governments (e.g. the UK) make also use of quantitative methods to measure infrastructure projects effects, like ex-post CBA.

The World Bank, still publishes influential papers and guidelines on CBA, but has lost interest in systematically applying CBA for ex-post evaluation. The most recent Annual Reviews of Development Effectiveness prepared by the IEG, for example, have simply ceased to publish information of project rates of return, and shifted to qualitative project rating. The latter is clearly interesting as a management tool and addresses the Bank's need to guarantee transparency over its whole portfolio of projects; yet, it provides very synthetic information about projects effects that have nothing to do either with a CBA exercise or with in-depth case studies. The latter are nevertheless carried out for selected projects, in order to complement the results deriving from the performance rating system.

In the case of the European Commission, ex-post evaluation is implemented on a sample basis. Case studies have been a privileged tool for infrastructure project evaluation, but also ex-post CBAs have been carried out. In particular, it seems that the arena for reviving ex-post CBA in the XXI century is in the context of the European Union. In the past years the European Commission has increasingly made use of CBA to complement surveys and interviews about project performance. The project impacts have been evaluated by re-assessing the net present values and rates of returns of projects with more recent data available after the project's completion. Beside the quantification of present cost and benefits of project, this kind of analysis gave the opportunity to reflect about the divergences between ex-ante and ex-post CBA results. However, the mechanisms explaining the project history and success have generally not been investigated in a structured way either by the World Bank or the European Commission, at least until the recent DG Regio ex-post evaluation of major projects co-financed in the 1994-1999 programming period. Actually, this study has been focused not only on the identification of long-term effects produced, but also on the mechanism determining project success, in line with the Hirschman's approach adopted in the late Sixties. The method applied did not consisted in reassessing ex-ante CBA results, but in carrying out completely new cost-benefit analyses, with cost and benefit items that could differ from those identified before project implementation. These acted as magnifying lens over specific project features, making it possible to raise key ideas about the project's effects and determinant factors of their outcomes.

Such methodology, tested on ten EU major infrastructure projects, can be in principle easily replicated for other infrastructure projects. The evaluation Team produced a list of lessons and methodological issues raised in applying CBA in ex-post project evaluation (CSIL, 2012). Such lessons can be used as guidelines for future ex-post evaluation studies in the EU context, complementing the Commission's Guide for CBA primarily used during the appraisal process (European Commission, 2008), but also in other contexts. This innovative evaluation methodology goes deeper in the project features, leading to meaningful lessons about project performance.

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