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Application of BCA in Europe – Experiences and Challenges

Abstract: Although benefit-cost analysis (BCA) can be traced back to European thinkers, its first practical applications were in the United States. Recent years have witnessed a growing demand for economic appraisals of policies in different sectors in Europe, but the implementation rate is still low compared to that in the United States. This article introduces a symposium that includes four articles that present current examples of how BCA is being applied in different sectors and in different institutional settings in Europe. They deal with environmental valuation in the United Kingdom, economic analysis for investment in Sweden's transport sector, economic versus financial returns in European Union investment project appraisal, and BCA in EU chemicals legislation. The goal is to stimulate continuing discussion on the implementation of BCA, not only in Europe but also worldwide.

Keywords: benefit-cost analysis; chemical risks; environment; Europe; regional development; transportation.

JEL classifications: D04; D61; H40.

1 Introduction

Society faces the challenge of how to allocate scarce resources in the face of unlimited wants. In many cases, the decisions by individuals and firms in markets lead to an efficient allocation of these resources. However, in other cases when markets fail to operate efficiently due to externalities or collectively consumed public goods such as clean air, government policy is considered to intervene in the market to address these market failures. The question then becomes which interventions can be motivated from society's broad point of view.

In line with intuition, regulations can be promoted if their benefits outweigh their costs. Indeed, this intuition is the conceptual framework for the policy evalu-

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ation tool often favored by economists, benefit-cost analysis (BCA).[1] Benefit-cost analysis is considered a powerful tool for policy evaluation since it provides both a systematic approach to estimate the positive and negative effects from the suggested policies, and transparency since it requires of the analysts to list the benefits and the cost with details on how they were obtained. In addition, it allows ordinary people's preferences to be reflected in government decision making as they would be in the market. Well-established guidelines exist on how to conduct a BCA. In this introduction, we shall not discuss how to conduct a BCA since we expect most readers to be familiar with the procedure. For those not familiar with BCA recent and excellent readings are Florio (2014) and Johansson and Kriström (2015).

Despite BCA's obvious attractiveness for policy evaluation, its implementation rate varies between countries and sectors. There may be many reasons why it is not used. For instance, the monetization of all benefits and costs is necessary for the implementation of BCA, and especially for health and environmental benefits monetary valuation has been considered unethical by opponents to BCA. Moreover, especially when BCA was first introduced as an evaluation tool, it was often considered as a way to avoid or postpone regulation, and hence those trying to promote regulation were often arguing against its use (Shapiro, 2011). However, as Shapiro describes in his overview of the evolution of BCA in U.S. regulatory decision making, this view has changed over the years. Another issue is the political will. BCA was adopted in the United States much earlier as a policy evaluation tool than it was in Europe, and hence BCA has more widespread use in the United States. The objective of the symposium and this article is to highlight some of the experiences gained from using BCA in Europe and to draw some conclusions on what has been achieved and what the challenges ahead are. To achieve this, the symposium consists of four different articles covering different areas such as the environment (Atkinson, Groom, Hanley & Mourato, 2018), transportation (Andersson, Hultkrantz, Nilsson & Lindberg, 2018), chemical risks (Georgiou, Rheinberger & Vainio, 2018), and regional development (Florio, Morretta & Willak, 2018), in different countries and institutional settings.

This introduction to the symposium is organized as follows. In the following section we provide a brief historical description of the origin and practice of BCA in the United States and Europe. In Section 3, we provide short summaries of the four articles in the symposium. The article ends with some concluding comments in Section 4.

1 The term benefit-cost analysis (BCA) is typically used in the United States, whereas in Europe it is often called cost-benefit analysis (CBA). Usually BCA and CBA can be used interchangeably, an exception is provided by Zerbe (2017) who made a distinction between the two based on what is legally possible. In this article, we follow the U.S. tradition.

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2 A comparison of the practice of BCA in the United States and Europe

BCA has to a larger extent been implemented in the United States than in Europe, even though the origin of BCA can be traced back to work done by European scholars. The French engineer and economist Jules Dupuit established in the mid-19th century the notion that polices could be evaluated based on their costs and benefits defined in terms of human preferences (Dupuit, 1844). In Dupuit's work on the economic justification of roads and bridges, he showed that the net benefits of the projects were measured by the consumer surplus. His ideas were later formalized by the British economist Alfred Marshall (1890). Also central to the development of BCA was the notion of externalities, which required a way to estimate the benefits and the costs of regulation. The British economist Arthur Pigou (1920) developed the idea of the difference between private and social costs, with this difference reflecting the value of externalities.

The purpose of BCA is to provide guidance, and perhaps even a decision rule, when considering different policy alternatives. BCA will indicate which alternative is welfare maximizing based on the assumptions and techniques used in the analysis. The theoretical foundations of BCA, as we know them today, were provided by the Hungarian–British economist Nicholas Kaldor and the British economist John Hicks in the 1930s (Hicks, 1939; Kaldor, 1939). Their work resulted in what is known as the Hicks–Kaldor (or Kaldor–Hicks) compensation principle (see, e.g., Johansson & Kriström, 2015). The principle is based in the theory of Pareto optimum developed by the Italian economists Vilfredo Pareto. However, since a Pareto improvement cannot occur if someone is made worse off, it is considered impractical for actual policy-making, since there always will be winners and losers, and hence the Pareto criterion would favor the status quo. The compensation principle relaxes the requirement that none should be made worse off by stating that a policy/project is desirable if the money measures of the gains exceed those of the losses, that is, the benefits exceed the costs, and therefore the "winners" could potentially compensate the "losers."[2]

Despite its European origin, BCA, as we know it today, was first broadly implemented in the United States. The U.S. Flood Control Act of 1936 required the U.S. Army Corps of Engineers to conduct BCA and is often regarded as the first use of

2 These two paragraphs provide a very terse description of the history of the development of BCA. They were not intended to provide a full description, nor to provide a discussion of criticism of the theories. Instead, the objective was to highlight the European origins of the theory of BCA. For those interested in a more comprehensive discussion of the BCA, both theory and empirical considerations we recommend publications on BCA such as Johansson and Kriström (2015) or Boardman et al. (2013).

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BCA (e.g., Pearce, Atkinson & Mourato, 2006; Boardman, Greenberg, Vining & Weimer, 2013).[3] In the 1950s attempts were made to integrate BCA through the Federal Inter-Agency River Basin Committee's Green Book of 1950, the Bureau of Budget's Budget Circular A-47 of 1952, and the Rand Corporation's work related to efficiency in Government military spending (Pearce et al., 2006). However, the main boost to the use of BCA in the United States came as a result of President Ronald Reagan's Executive Order 12291 issued in 1981.[4]

Reagan's Executive Order mandated the use of regulatory impact analysis of regulation with an impact of $100 million or more. More precisely, it stated "[R]egulatory action shall not be undertaken unless the potential benefits to society for the regulation outweigh the potential cost to society.", which is the essence of BCA. Since Reagan had campaigned on a deregulating platform many saw the purpose of the executive order as anti-regulatory. Some perceived it as being used politically to provide arguments against regulation, and/or to require lengthy analysis that would delay regulation with the potential to eventually kill it. Other criticism against the use of BCA was more on ethical grounds, such as the critique of monetizing health effects or environmental goods. Despite the criticism of BCA, President Bill Clinton did not abandon BCA for regulatory impact analysis. He did, however, issue Executive Order 12866 that changed some of the language from Executive Order 12291.[5] For instance, instead of benefits exceeding the costs of the regulation they should justify the costs, and it added "reduction of discrimination or bias" as a benefit to be considered. Clinton's acceptance of BCA as a tool for regulatory impact analysis did not stop the debate surrounding BCA, though. Adversaries continued to argue for the elimination of BCA, whereas supports continued to work on how to improve it. Today the debate is a bit more nuanced with BCA also being considered a tool to promote regulation, and despite the debate not being settled, it now focuses much on improving the practice and considering aspects, like distributional issues not considered in "traditional BCA."[6]

In Europe the United Kingdom (U.K.) is considered an early adopter of BCA. The first sector to use BCA was the transport sector when it evaluated a highway project between London and Birmingham, and a London subway project in the early 1960s (Mackie, 2010). Its introduction was not without controversy. One early application was the economic appraisal of a third London airport of which the project appraisal was labeled as "nonsense on stilts" and the method itself as

3 Earlier use of policy evaluation based on a comparison of benefits and costs exist (see, e.g., Zerbe, 2017), but the 1936 Flood Control Act is usually regarded as the first use of BCA.
4 Exec. Order No. 12291 46 Fed. Reg 13193 (Feb. 19, 1981).
5 Exec. Order No. 12866, 58 Fed Reg. 51735, Admin Mat 45070 (Sept. 30, 1993).
6 See Shapiro (2011) for a discussion of the critique against BCA and the evolution of its use in the United States.

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"bastard science and/or insidious poison in the body politick" (Self, 1970; Williams, 1972). However, despite the criticism other sectors followed in the footsteps of the transport sector with individual government ministries/departments using BCA for flooding and coastal protection, land drainage schemes, and defense policies (Turner, 2007). There was more resistance to adopt BCA for environmental policies but the turning point came in the early 1990s with the publication of "Policy Appraisals and the Environment" (Department of the Environment, 1991) that called for the use of BCA and provided the guidelines on how to do so (Turner, 2007).[7]

At the European level, represented by the European Commission within the European Union (EU), it is thought that BCA was not used for policy evaluations until the early 1990s (Pearce, 1998; Turner, 2007). BCA was introduced through EU regulation in the form of Article 130r of the 1002 Treaty of the EU (see, Pearce et al., 2006) and EU regulation from 1993 and 1994.[8] The first BCA Guide, which was a brief document without any legal status, was published in 1994 (European Commission, 1994). Since then four new editions have been published with the latest in 2014 (European Commission, 2014). The last version provides a comprehensive guide and is backed by EU legislation. In an examination of the role of BCA at the EU level prior to early 2000, Pearce (2004) concluded based on case studies that BCA was often not conducted and that "The Commission has thus failed to honor the letter and spirit of the Maastricht Treaty." (p. 133). The article by Florio et al. (2018) in the symposium of this issue of the journal provides an examination of the role of BCA of more recent projects.

BCA is not yet as well established in Europe as it is in the United States. However, it has gained a lot of ground in the recent decades which is reflected by the many manuals/guidelines on how to conduct BCA that have been published for different sectors and not only at EU level as mentioned above (European Commission, 2014), but also at national level. Examples of national guidelines include for France, Quinet et al. (2013), for Sweden, ASEK (2016) and Kriström and Bonta Bergman (2014), and for the U.K., U.K. HM Treasury (2011). Guidelines and manuals are, however, not assurance that BCA is accurately carried out, universally accepted, and actually implemented. In the next section, we provide a summary of experiences of BCA from different sectors and institutional level in Europe.

7 The use of BCA for environmental policies in the U.K. is covered in more detail in the articles by Atkinson et al. (2018) in this symposium.
8 Art. 14, Reg 2082/93 and Art. 10(5), Reg. 1164/94.

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3 Symposium articles

The following four sections provide short summaries of the four articles included in the symposium. The articles provide two examples of experiences at the national level, from the U.K. and Sweden, and two from the EU level, one based on the experience from the European Chemical Agency and one based on work on the European Cohesion Fund. The topics of the articles were selected to provide in addition to a range of institutional settings also a range of sectors covered, that is, environment, transportation, chemical risk, and regional development.

3.1 Environmental valuation and benefit-cost analysis in U.K. policy

Atkinson et al. (2018) discuss BCA from the perspective of environmental valuation. The authors provide a discussion of: the trends of nonmarket valuation in the U.K.; how this exemplifies the use of environmental valuation and BCA in decision making across a wide range of environmental policies or investment projects with environmental impacts; and, how institutional processes have sought to embed environmental valuation in U.K. decision-making procedures.

The authors explain that this policy use can be traced back a number of decades with much of this early work featuring prominently a survey based approach, known as the stated preference (SP) method. These SP approaches, for example, have been used extensively since in U.K. policy and project decisions for water quality improvements. More generally, the experience here has involved a range of approaches including revealed preference (RP) methods as well as, more recently, subjective wellbeing valuation. Other important developments include, on the one hand, distillations of the expanding empirical record of valuation studies, via sharable databases of environmental values, thereby broadening policy use and, on the other hand, a deepening of this use as a result of building environmental valuation into policy models which contain a richer description of the physical environment (e.g., the spatial configuration of ecosystems and land use).

In moving on to discuss how BCA has been used to inform policy decisions, the authors consider the cases of the water sector and conservation policies, which reflect a process driven both by the U.K. itself and EU directives and legislation. The authors highlight, for example, the Water Framework Directive[9] and the way BCA has played an important role in providing information on when costs of

9 EC/20000/60/EC.

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implementing the directive are "disproportionate" to the benefits, given that such situations provide some flexibility for member states from achieving the required standards according to the directive. Regarding when Water Framework Directive costs are "disproportionate" – for the U.K. public body charged with planning its implementation – essentially this boils down to a rule of thumb for benefit-cost ratios. The authors describe a situation where considerable resource costs have been saved in the water sector as a result of the use of BCA in this way. However, the authors also stress that BCA is not always the "driving force" behind priorities and policies, and that its use has not resolved long-standing policy debates about "development versus environment."

Nevertheless, the assessment of environmental valuation and BCA in the U.K. in Atkinson et al. (2018) is overall positive. Their reasoning is the large number of instances where it can be said to have contributed to (rather than solely determined) policy decisions. Moreover, the authors argue, institutional processes appear to point in this direction too, whether based on the established centrality of The Green Book (U.K. HM Treasury, 2011) in creating a BCA culture in U.K. policy-making or more novel ways that are emerging to embed environmental valuation in the work of government departments and agencies responsible for policy implementation.

3.2 Economic analysis for investment priorities in Sweden's transport sector

Andersson et al. (2018) describe the evolution of BCA in the Swedish transport sector and current issues in its implementation. The study focuses on its practice for road and railway investments due to its limited use to date in other transport sectors such as airport or maritime infrastructure investments.

The study describes how the Swedish road construction program of 1958 gave road engineers a strong influence over the parliament's priorities in the allocation of resource for road construction. The program become the practice over the following decades, but in the 1970s there was a move toward economic appraisals of infrastructure projects by first the development of BCA for road projects and then a parliamentary decision in 1979 that established pricing of infrastructure, road and railway, based on economic principles. Further development in the 1980s and the creation of an agency in charge of BCA in the 1990s established economic appraisal as a formal requirement of road and railway infrastructure projects in Sweden.

Andersson et al. (2018) in their overview describe the principles and guidelines provided for evaluations of policies and projects in the Swedish transport sector and provide a critical discussion of the political considerations taken in actual imple-

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mentation of these principles and guidelines. The article also summarizes previous findings on the role of BCA in actual decision making in the transport sector in Sweden. They provide evidence suggesting that BCA plays more of a role today than when it was first implemented as a decision tool, although the transport agencies do not follow a strict BCA test when they prioritize between policies and projects. To put their findings in perspective they provide a comparison and discussion of the situation in Norway, where BCA is also used but has less influence on the priorities set.

The estimation of benefits and costs for the Swedish transport sector is discussed, and the authors describe how the monetization using RP and SP methods is well established and how values used have been examined and revised in the several guidelines created over the years. However, an issue discussed is the risk of optimism bias, that is, an *ex ante* underestimation of costs, in the estimation of the cost of policies/projects. The authors discuss both explanations for such bias, and proposed remedies for it. Moreover, examples of other issues covered in the article are whether the discount rate should include a risk term, and how to account for the marginal cost of public funds.

The article by Andersson et al. (2018) describes a context in which BCA is generally accepted as a tool for economic appraisals and has grown in importance. It also describes, though, the reality of implementing BCA in a context of different disciplines having different priorities, and political considerations being taken.

3.3 Cost-benefit analysis and European Union cohesion policy: economic versus financial returns in investment project appraisal

Florio et al. (2018) provide a comprehensive review of the policy framework and investigate the role of BCA in the context of the EU Cohesion policy. The Cohesion policy is an investment policy of the EU with the aim at reducing regional disparities existing in Europe.

The authors describe that 1987 was a turning point for the application of structural funds in the EU. Before 1987 applications were left to the discretion of national governments, but from 1987 forward the European Commission (EC) demanded common guidelines on how to evaluate, *ex ante*, and compare project applications from different member states. This was enforced in 1993 and 1994 with regulation requiring, among other things, that BCA be conducted on the proposed projects. In connection with the new regulations, a BCA guide was published. From its first version, a brief document intended to bring some discipline in the application process, it has now developed into a comprehensive guideline for

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different sectors and is well backed by EU legislation. The authors highlight the importance of the methodological developments of the BCA guides over the years, especially in light of the enlargement of the EU with 10 new countries in 2004. To illustrate, during 2007–13 the EU allocated £347 billion with the highest concentration earmarked for lagging regions, of which many were (are) among the new members from 2004 and later.

As explained in the article, a distinctive feature of the evaluation of project applications is the requirement to estimate both the project's Financial Net Present Value (FNPV) and its Economic Net Present Value (ENPV). The former assesses whether the project is sustainable and/or viable from a financial point of view, that is, whether the project's net revenues can repay the initial investment. Only projects that are *not* financially profitable are eligible for EU funding. The latter, that is, ENPV, conducts the economic analysis from a social point of view. That is, whereas FNPV evaluates cash-flows at market prices, ENPV uses shadow prices and includes externalities and nonmarket benefits and costs in the analysis. As pointed out by Florio et al. (2018), most BCA manuals only focus on the analysis corresponding to the ENPV. An important advantage with the two perspectives from EC's point of view is that it may mitigate optimism bias since too optimistic cost or benefits estimates "may lead to a self-defeating strategy" by producing a FNPV $>$ 0, which would mean that the project would not be eligible for EU funding.

Florio et al. (2018), in addition to their review, also provide an empirical analysis using a dataset of around 1000 projects applications from 2007–13. They find that project applications on average have a negative FNPV and a positive ENPV. Moreover, they find a positive correlation between the two, controlling for other variables in a multivariate regression analysis. This correlation suggests that on average project proposals expected to provide net social benefits are not the most (financial) loss-making ones. The authors explain that the BCA analysis, as conducted in this framework, captures the socioeconomic impact after the EU grants.

The study by Florio et al. (2018) shows that BCA can be implemented in a complex political context with many different governments involved, and a potential conflict between central and regional ambitions.

3.4 Benefit-cost analysis in EU chemicals legislation: experiences from over 100 REACH applications for authorisation

Georgiou et al. (2018) in their review of BCA within the framework of the EU's REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)

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Regulation describe the background of the authorization process and provide a critical discussion of how it has been implemented so far.

The authors start from the observation that even before REACH was adopted in 2006 there were, based on the chemicals legislation at the time, expectations that advantages and disadvantages of risk reductions related to chemicals should be considered. Moreover, as described above, there was also the obligation for the EC to conduct BCA for its policy proposals. However, as the authors explain, to what extent any assessment was undertaken varied greatly. The implementation of REACH was a reaction to this with the aim to, for example, address a resource-intensive regulation process and a better knowledge of benefits and costs of regulating chemical risks. One component of REACH is to conduct a socioeconomic analysis. The novelty of REACH is that it places the responsibility of conducting the economic appraisals of the effects from the regulations on the industry affected, hence "reversing the burden of proof" compared to more standard policy evaluations where the authorities conduct the analysis.

The main part of the article provides an in-depth discussion of how BCA has been implemented under the REACH authorization regime to date. The authors structure their discussion based on the points for regulatory impact analysis recently suggested by Dudley et al. (2017). For each point they provide examples of problems encountered in the review process. A common thread in the discussion of the problems encountered is the difference in perception of what the objective of the economic assessment of the regulations is. Whereas REACH has a societal perspective, the firms' objective is often to examine how the regulation affects them. This is reflected in how the analyses have been conducted so far with, for example, firms often not considering distributional effects or effects on other firms, such as competitors, in the market when conducting their analyses.

Georgiou et al. (2018) end their discussion with suggestions on how to move forward. Despite the problems discussed in their review, they consider REACH to have been a partial success because European firms have been able to apply a benefit-cost logic to their use of substances of very high concern. Moreover, the authors stress that a learning process is taking place among all stakeholders, not only the regulated firms, but also the EU and national regulatory agencies, and hence, problems raised in their article will be or have already been addressed.

4 Conclusions

Europe is still lagging the United States when it comes to using BCA for policy evaluation. However, the last couple of decades have seen a change with BCA

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becoming both more accepted and implemented in European policy-making, both at national and European level. The symposium summarized in this article provides four illustrations of this development. Common to the symposium articles is the discussion of the challenge of implementing a relatively straightforward evaluation tool in actual decision making.

Benefit-cost analysis is a powerful tool for policy evaluation. Economists would, however, not argue that it should be the sole basis for decision making and that agencies should be bound by strict benefit-cost tests. As pointed out by Arrow et al. (1996), "[BCA] should not be viewed as either necessary or sufficient for designing sensible public policy", but it is a good way to ensure consistency in public decision making and it provides transparency to the political process. Moreover, it mitigates the risk of "lexical" considerations in decision making, that is, decisions being made based on a single goal and/or group of people. Hence, BCA has an important role to play, not only in Europe but also worldwide.

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