Attitudes towards the role of Cost-Benefit Analysis in the decision-making process for spatial-infrastructure projects: a Dutch case study

Abstract:

This paper provides a systematic overview of the attitudes of key actors in the Dutch Cost-Benefit Analysis (CBA) practice towards the role of CBA in the decision-making process for spatial-infrastructure projects. The main aim of this paper is to scrutinize the extent to which there is agreement among these Dutch actors in regard to the role of the CBA in the decision-making process. A secondary goal is to provide possible explanations for agreements and controversies among key actors in the Dutch CBA practice. In this study two research methods are combined to study the key actors' attitudes. Firstly, 86 key actors (e.g. consultants, scientists, policy makers) were interviewed in-depth. Secondly, 74 of them completed a written questionnaire. The most important conclusion of this paper is that in the Dutch CBA practice there is agreement that CBA must have a role in the appraisal process of spatial-infrastructure projects. However, there is a lot of controversy among economists and spatial planners in the Dutch CBA practice concerning the value that is and should be assigned to CBA in the decision-making process. Economists predominantly believe that not enough value is assigned to the CBA in the decision-making process, whereas spatial planners predominantly think that too much value is assigned to the CBA. Both economists and spatial planners believe that this controversy is problematic as it results in debates about the pros and cons of CBA instead of the pros and cons of the spatial-infrastructure projects. This paper analyzes some solutions for this controversy.

1. Introduction

The (Social) Cost-Benefit Analysis (CBA) is a widely used ex-ante evaluation tool used to support the decision-making process in transport in most western countries (e.g. Grant Muller et al., 2001; Hayashi and Morisugi, 2000; Odgaard et al., 2005; Vickerman, 2007). Despite its popularity, the role of CBA in decision-making processes for transport projects is a continuous topic of debate in countries and institutions where it is used (e.g. Hamers et al., 2012; Mackie, 2010; Sager and Ravlum, 2005; World Bank, 2010). The topic of the role of CBA is often discussed in academic literature as well. For the purpose of this paper, we distinguish two categories of literature. One category aims to determine the actual influence of CBA on investment decisions with both quantitative and qualitative analysis (e.g. Eliasson and Lundberg, 2012; Grant Muller et al., 2001; Nellthorp and Mackie, 2000; Nyborg, 1998; Odeck, 1996; Odeck, 2010). The broad picture is that these studies show that planners'/politicians' rankings of investments are to some extent influenced by benefit-cost ratios and CBAs are in some cases used for enhancing project alternatives and for evaluating alternative options (for the same project) but not for making a final decision.

A second category of literature analyzes the disagreement about the usefulness of CBA as a decision-making support tool, reflects on the actual role of CBA or presents a view on the ideal role in the decision-making process (e.g. Frank, 2000; Lohmann, 1977; Mackie, 2010; Quinet, 2000; Sen, 2000; Shapiro, 2010; Sunstein, 2000; World Bank, 2010). Although this literature produces many useful recommendations for improved use of and the role of CBA in the decision-making process, it

should be acknowledged that the analyses and recommendations are solely based on deep knowledge and the perceptions of the author(s).

Based on the literature, we conclude that CBA is used to some extent (in other words, plays some role) in actual decision-making processes in the world. The main aim of this paper is to add to the literature by systematically analyzing the attitudes of 86 key actors (e.g. consultants, scientists, policy makers) in the Dutch CBA practice towards the role of CBA in the decision-making process for spatial-infrastructure projects[1]. This paper also aims to give possible explanations for converging and diverging attitudes towards the role of CBA in a decision-making process based on the 86 actors' perceptions of advantages and disadvantages of CBA.

In our view, analyzing key actors' attitudes towards CBA's role is scientifically relevant in itself because, to the best of our knowledge, this focus on attitudes of actual CBA actors has never been carried out before. The societal contribution of this paper is that the results can lead to more productive and efficient discussions regarding the role of CBA in decision making, because actors with different backgrounds (e.g. economists and spatial planners) may understand each other better if their attitudes towards CBA's role (which may be very different) are made explicit. Additionally, we think that more insight into the converging and diverging attitudes of key actors in regard to the role of CBA can pave the way for more specific scientific research towards (understanding and enhancing) the role of the CBA in practice.

Section 2 presents the research methodology. Section 3 presents the results. Section 4 provides some possible explanations for the results. Finally, section 5 provides conclusions and discusses the results.

2. Research methodology

We have chosen to select the Netherlands as a case study because we are Dutch researchers and we know the Dutch community and procedures better than those of other countries. In the Netherlands, a guideline for carrying out a CBA for infrastructure projects (the so-called OEI-Guideline, Eijgenraam et al., 2000) was constructed in the year 2000. Since then, a CBA that is in line with the OEI-Guideline has become compulsory in the decision-making process for all large infrastructure projects. Since 2007, it is also obligatory to assess spatial-infrastructure projects, (co-) funded by the Dutch national government, with a CBA (Ministry of transport and water management and Ministry of housing spatial planning and the environment, 2009). Besides a CBA, it is obligatory to carry out an Environmental Impact Assessment (EIA) which, amongst other things, scrutinizes the project alternative that is most favorable for the environment. Both the CBA and the EIA are presented to decision makers.

In the Netherlands, spatial-infrastructure plans are predominantly developed on a regional level. However, regions do have limited financial resources and frequently need to apply for funding by the national government. A positive Benefit-Cost Ratio (BCR) is not a formal requirement for approved funding. The official function of CBA is to provide transparent policy information for the preparation of infrastructure projects, and public administrators are not formally bound to the results of the studies. However, ministers who do not act in line with the results have some

[1] Because in the Netherlands ex-ante evaluation using CBA is obligatory for all spatial-infrastructure projects (and not only transport projects) applying for co-funding by the Dutch Government, we decided to adjust our aim to this obligation.

explaining to do (De Jong and Geerlings, 2003). In the Netherlands the national government applies the CBA in their decision about the extent to which funding is approved for the specific project. This 'individual approach' is in contrast to countries such as Sweden where CBA is applied to rank large numbers of investments against each other (see Eliasson and Lundberg, 2012). Because of the extensive use of CBA in the Netherlands over the last 13 years, we think that the Dutch CBA practice can be regarded as an interesting case study.

In this study, two research methods are combined – in-depth interviews and a written questionnaire – to study the key actors' attitudes towards the role of the CBA in the decision-making process. Because we did not have an a priori idea about which questions were paramount to ask in the written questionnaire in order to reveal key actors' attitudes towards the role of CBA in the decision-making process, we first interviewed them in-depth. In the interviews, we asked them about their attitude towards the role of CBA. Moreover, we asked them to mention the most important advantage and the most important disadvantage they experience when using CBA in the decision-making process and why they think this is an (dis)advantage. We asked specifically for their perceptions of advantages and disadvantages because we think it is likely that the actors' attitudes towards the role of the CBA in the decision-making process are mainly founded in their assessment of CBA advantages and CBA disadvantages.

2.1 Selection of respondents

In order to obtain a more or less complete overview of Dutch key actors' attitudes towards the role of CBA in the decision-making process for spatial-infrastructure projects, the aim of the research was to interview all the individuals that had an explicit and recognizable role in the Dutch CBA practice in the last decade.[2] For this research 86 key actors were interviewed. To identify the key actors in the Dutch CBA practice, we used a three-stage method (see, Mouter et al., 2013). Fifteen people that were also approached were not able to or were not interested in participating in the research. Thus, we did not manage to interview the entire population as intended and the 86 respondents must be considered as a sample of the entire population of key actors. Therefore, we test the significance of the results that followed out of this study with logistic regressions under the assumption that the 86 respondents are a random sample of the entire population of key actors in the Dutch CBA practice. Our main argument for considering the sample to be random is that 'lack of time' was the reason for the non-participation of fourteen of the fifteen people that did not participate in the research.

2.2 Questions asked in the written questionnaire

From the interviews we concluded that three questions were paramount to ask in the written questionnaire – see below. Question (3) is split into four sub-questions. We asked these three questions because we found in the interviews many different and subtle viewpoints on the role of CBA, the value which should be attributed to CBA (e.g. negative CBA results should mean a negative

[2] The second and the third authors of this contribution are part of this population; however they were not interviewed in order to avoid bias.

decision), and the comparison of CBA with other tools. In this paper we use these different viewpoints from the in-depth interviews to explain agreements and controversies (see section 4). In addition, via a written questionnaire, we checked key actor's attitudes towards three core topics such as: "do you see any role for CBA or none at all", for example? The questionnaire was completed by 74 of the 86 respondents.

(1) Do you think CBA must have any role in the appraisal of spatial-infrastructure projects?

- Yes, I think that CBA should have a role;
- No, I think that CBA should not have any role;
- No opinion.

(2) How do you evaluate the value that is attributed to CBA in the decision-making process for spatial-infrastructure projects nowadays?

- I am satisfied with the value that is currently attributed to the CBA in the decision-making process;
- I think that too much value is attributed to the CBA in the decision-making process;
- I think that too little value is attributed to the CBA in the decision-making process;
- No opinion.

(3) Do you think that the advantages of CBA outweigh the disadvantages compared to:

a) Multi-criteria analysis (MCA)[3], for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in classic infrastructure projects[4]?
b) MCA, for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in spatial projects[5]?
c) A situation without CBA or MCA, for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in classic infrastructure projects?
d) A situation without CBA or MCA, for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in spatial projects?
    - CBA has got more advantages than disadvantages compared to the alternative[6];
    - CBA has got more disadvantages than advantages compared to the alternative;
    - I am neutral concerning advantages or disadvantages of CBA compared to the alternative;
    - No opinion.

[3] Like Cost-Benefit Analysis, Multi-Criteria Analysis (MCA) is an ex-ante evaluation instrument. A Cost-Benefit Analysis is based on welfare theory. A CBA evaluates the effects of project alternatives on the welfare of – in most cases – a country. A MCA evaluates how different project alternatives 'score' on different criteria (the welfare effect of the project might be one of the criteria). Although we are aware of literature suggesting hybrid models combining CBA and MCA (see section 5) interview results reveal that a MCA is often seen by Dutch key actors as competing with CBA.

[4] In the written questionnaire, 'highways' and 'railroads' were stated as examples of classic infrastructure projects.

[5] In the written questionnaire 'integrated land use and transportation projects' and 'flood protection projects' were stated as examples of spatial projects.

[6] For questions 3a and 3b 'MCA' was the alternative; for questions 3c and 3d 'a situation without CBA or MCA was the alternative'.

In order to determine the extent to which different groups in the Dutch CBA practice have a different attitude towards the role and (dis)advantages of CBA, the respondents were asked – in the written questionnaire – to express their main specialization regarding CBA (economics, spatial planning or ecology[7], transportation) and their main profession regarding CBA (consultant, scientist or researcher, policy maker or lobbyist[8]). Table 1 classifies the respondents in relation to their main specialization and main profession.

Table 1: Respondents classified in relation to their specialization and profession.

	Profession			
Specialization	Consultants	Scientist/Researcher	Policy maker	Total
Economics	13	24	7	44
Spatial Planning	1	5	11	17
Transportation	5	8	12	25
Total	19	37	30	86

2.3 Analysis of the interviews with content analysis

Soon after the interview (within 24 hours when possible), the interviewer processed a report which then constituted textual data for analysis. This report contained the word-for-word texts of the interviewee (based on audio recordings). The method used to analyze the data is content analysis. Its main aim was to compress many words of text into fewer content categories based on explicit rules of coding and categorizing (e.g. Krippendorff, 2004; Lombard et al., 2004). The content analysis was carried out in two steps. First, perceptions of advantages and disadvantages that were mentioned by the respondents in the interviews were coded and grouped into (dis)advantage categories by the first author. To make the coding process transparent and replicable, the first author developed a 'coding and categorizing protocol' in which the rules for coding are described. For the development of the protocol, different (dis)advantage categories had to be distinguished. The categories were based on the literature (e.g. Annema et al., 2007; Mackie, 2010; Naess, 2006; De Jong and Geerlings, 2003; Eliasson and Lundberg, 2012; Nguyen-Hoang and Yeung, 2010; Quinet, 2010; Saelensminde, 2004; Salling and Banister, 2009; Ševcíková et al., 2011; Tudela et al., 2006), the Dutch CBA-guidelines (Eijgenraam et al., 2000) and evaluations of the Dutch CBA practice (BUCK, 2002; B&A, 2010). Besides the demarcation of the different (dis)advantage categories an important aim of the coding and categorizing protocol was to clarify whether a respondent's perception of a negative aspect of the CBA could be defined as a (theoretically) solvable negative aspect or a (theoretically) insolvable negative aspect. In accordance with Mouter et al. (2013), in this paper we label the (theoretically) solvable negative aspects as 'substantive problems' and the (theoretically) insolvable negative

[7] From now on this group of respondents is labeled as 'spatial planning'.

[8] 'policy maker'.

aspects as ‘disadvantages’. Moreover, the respondents’ negative perceptions concerning the use, the interpretation and the extent to which people understand the CBA are considered as disadvantages in this study and not as substantive problems because the quotes do not refer to the content of the CBA. For further elaboration on the results of actors’ perceptions of substantive problems when appraising spatial-infrastructure projects with CBA, we refer to Mouter et al. (2013).

After the first round of coding the ‘coding and categorizing protocol’ was revised. For instance, (dis)advantage categories needed to be added because respondents mentioned (dis)advantages that were not found in the literature. This revised ‘coding and categorizing protocol’ was verified by the second and third author. For the second step of the content analysis all perceptions of advantages and disadvantages in the interviews were coded and categorized all over again based on the revised ‘coding and categorizing protocol’. This second step was carried out by the first author (first coder). In a case where the first author was not sure whether a respondent mentioned a (dis)advantage, or when he was not sure in which category a (dis)advantage should be placed, he discussed the issue with the second author (second coder) until an agreement was reached.

2.4 Intercoder reliability

The intercoder reliability of the content analysis was tested in two phases by two independent coders. In accordance with the literature (e.g. Lombard et al., 2004), more than 10% of the body of content was tested. In the first phase, the first independent coder (not one of the authors of this paper but a PhD student in the research group involved in another topic) repeated the full coding task (coding substantive problems, advantages and disadvantages, and grouping them into categories) for 10 randomly selected interviews. With this test we analyzed the extent to which two coders coded the same textual data as ‘advantages’ and ‘disadvantages’ and grouped these codes in the same (dis)advantage categories. In the second phase, the second independent coder (a Master student) repeated a part of the coding task. His task was to group the advantages and disadvantages that were coded by the first author into (dis)advantage categories. The second independent coder completed this task for nine interviews (one interview was used as practice). Through this test we analyzed the extent to which two coders group textual data that is coded as (dis)advantage into the same (dis)advantage categories. The results of the intercoder reliability test are presented in section 4.1.

3. Results

This section presents the results regarding the attitudes towards the role of CBA in the decision-making process for spatial-infrastructure projects on which actors agree (section 3.1) and on which there is controversy (section 3.2).

3.1 Agreement on the role of CBA

Key actors agree on two aspects regarding the role of CBA in the decision-making process for spatial-infrastructure projects. Firstly, 73 out of 74 respondents in the written questionnaire believe

that CBA must have 'a' role in the appraisal of spatial-infrastructure projects. Secondly, 71 out of 72[9] respondents prefer the use of CBA in the ex-ante evaluation to support 'go' or 'no go' decisions for investments in classic infrastructure projects and spatial projects over a situation in which no ex-ante decision-support system (like CBA or MCA) is used.

3.2 Controversy about the role of CBA

In the written questionnaire key actors were asked to evaluate the value that is attributed to CBA (question 2). Table 2 presents – in total (row 2) and per group in the Dutch CBA practice (rows 4-10) – the number of respondents that mentioned each of the three possible answers.

Table 2: Attitudes towards the value that is attributed to CBA in the current decision-making process for spatial-infrastructure projects

	Too little value	**Satisfied**	**Too much value**	**No opinion**	**Total**
Total	22 (30%)	29 (39%)	19 (26%)	4 (5%)	74
Consultant	4 (22%)	11 (61%)	3 (17%)	0 (0%)	18
Scientist/Researcher	13 (38%)	12 (35%)	6 (18%)	3 (9%)	34
Policy maker	5 (23%)	6 (27%)	10 (45%)	1 (5%)	22
Economics	16 (40%)	21 (53%)	0 (0%)	3 (7%)	40
Spatial planning	2 (14%)	1 (7%)	10 (71%)	1 (7%)	14
Transport	4 (20%)	7 (35%)	9 (45%)	0 (0%)	20

Table 2 shows that none of the 40 respondents that consider themselves economists think that, in the current practice, too much value is attributed to CBA, whereas 71% of the spatial planners think that too much value is attributed to CBA in the decision-making process. Ordinal logistic regressions reveal that the attitude of economists towards the value that is attributed to CBA in the decision-making process significantly differs from the attitude of spatial planners and transport specialists ($p<0.05$). At first sight, table 2 seems to show that scientists/researchers assess the value that is attributed to CBA in current practice differently from consultants and policy makers. However, ordinal logistic regression reveals that there is no significant relation. Probably, the reason for this apparent difference is that the majority of the scientists/researchers participating in this study were economists as well (23). Based on the answers to questions (3a) and (3b) in the written questionnaire, we distinguish a second aspect of the role of CBA on which key actors disagree (table 3).

Table 3: Assessment advantages and disadvantages of CBA compared to MCA for ex-ante evaluation to support 'go' or 'no go' decisions for investments in spatial-infrastructure projects

Do you think that the advantages of CBA outweigh the disadvantages compared to MCA for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in **classic infrastructure** projects?

[9] One respondent did not fill in this question, another filled in 'no opinion'. Both consider themselves to be 'policy maker' and 'spatial planner'.

	Total		Consultant	Scientist/Researcher	Policy maker		Economics	Spatial planning	Transport
CBA has advantages compared to MCA (classic infra project)	54 (74%)		17 (94%)	26 (76%)	11 (52%)		37 (93%)	3 (23%)	14 (70%)
I am neutral concerning advantages or disadvantages of CBA compared to MCA (classic infra project)	8 (11%)		1 (6%)	3 (9%)	4 (19%)		1 (3%)	3 (23%)	4 (20%)
MCA has advantages compared to CBA (classic infra project)	8 (11%)		0 (0%)	4 (12%)	4 (19%)		0 (0%)	6 (46%)	2 (10%)
No opinion	3 (4%)		0 (0%)	1 (3%)	2 (10%)		2 (5%)	1 (8%)	0 (0%)
Do you think that the advantages of CBA outweigh the disadvantages compared to MCA for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in **spatial** projects?									
	Total		Consultant	Scientist/Researcher	Policy maker		Economics	Spatial planning	Transport
CBA has advantages compared to MCA (spatial project)	41 (56%)		11 (65%)	24 (69%)	6 (29%)		31 (78%)	1 (8%)	9 (45%)
I am neutral concerning advantages or disadvantages of CBA compared to MCA (spatial project)	14 (19%)		5 (29%)	4 (11%)	5 (24%)		8 (20%)	2 (15%)	4 (20%)
MCA has advantages compared to CBA (spatial project)	15 (21%)		1 (6%)	6 (17%)	8 (38%)		1 (3%)	9 (69%)	5 (25%)
No opinion	3 (4%)		0 (0%)	1 (3%)	2 (10%)		0 (0%)	1 (8%)	2 (10%)

Table 3 shows that, looking at the Dutch CBA practice in total, respondents prefer CBA over MCA for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in both classic infrastructure projects and spatial projects. However, economists and transport specialists on the one hand and spatial planners on the other hand have a significantly different attitude towards the advantages and disadvantages of CBA compared to MCA for this purpose ($p<0.05$). To illustrate, only 1 out of 40 of the economists (2.5%) perceives that MCA is a better alternative than CBA when it comes to the ex-ante evaluation to support 'go' or 'no go' decisions for investments in spatial

projects, whereas 9 out of 13 of the spatial planners (69%) perceive that MCA is a better alternative than CBA for this type of ex-ante evaluation. Moreover, ordinal logistic regression reveals that policy makers are more likely to prefer MCA over CBA for the ex-ante evaluation to support 'go' or 'no go' decisions for investments in spatial projects than consultants and scientists/researchers.

We conclude that the most important controversy concerning the role of the CBA in the decision-making process for spatial-infrastructure projects is among economists and spatial planners. Transport experts have a 'middle position'. The key actor's 'specialism' is more decisive for explaining his/her attitude towards 'the' role of CBA than his/her 'profession'.

4 Possible explanations for agreement and controversy

In order to give possible explanations for the agreements and controversy, we used the respondents' perceptions of advantages and disadvantages in which were uncovered during the in-depth interviews because we think that it is likely that the agreement and controversy of key actors towards the role of the CBA in the decision-making process is founded in their assessments of CBA advantages and CBA disadvantages. Section 4.1 presents the actors' perceptions of the CBA advantages and CBA disadvantages that they discussed in the interviews. The intercoder reliability of these results is tested in this study. The results of the intercoder reliability test are presented in section 4.1 as well. Section 4.2 discusses the way in which the perceptions of CBA (dis)advantages might be helpful to explain and understand the agreements and controversy among Dutch key actors towards the role of CBA in the decision-making process for spatial-infrastructure projects.

4.1 Actors' perceptions of CBA advantages and CBA disadvantages

Before we discuss the perceptions of CBA (dis)advantages we will present the results of the intercoder reliability tests. The result from the first phase of the intercoder reliability test was that the first author and the first independent coder found more or less the same (dis)advantage categories in the 10 interviews that were tested by the independent coder. However, we also conclude that the number of times advantage and disadvantage categories coded by the first coder and the first independent coder varied greatly, so this is, thus, unreliable. After the intercoder reliability test the first author and the first independent coder jointly discussed their differences in coding in order to explain the low intercoder reliability scores. They concluded that the most important reason for the low intercoder reliability score was that the coding task was complex. Firstly, the 'coding and categorizing protocol' entails many decision rules regarding the demarcation of the substantive problems, advantages and disadvantages (categories). As a result, it was very difficult for the first independent coder to take all decision rules into account simultaneously, leading to coding errors. For instance, the first independent coder forgot to consider the rule that quotes from respondents concerning the use, the interpretation and the extent to which people understand the CBA are considered as disadvantages during the coding of four interviews, which resulted in very low intercoder reliability scores. Secondly, it is more difficult to code the word-for-word texts of an interview compared to very structured news articles.[10] For more details regarding the explanations for the low intercoder reliability scores, we refer to Mouter and Vonk-Noordegraaf (2012).

[10] The content analysis method is often applied to these types of content.

We will now discuss the results of the second phase of the intercoder reliability test. The results from this phase were assessed using Krippendorff's Alpha, for two reasons. First, this agreement measure takes into account the possibility that coders could cluster a (dis)advantage into the same (dis)advantage category by chance. Second, Krippendorff's Alpha adjusts – in contrast to Scott's Pi, for instance – for small sample bias (Krippendorff, 2004; Riffe et al., 2005). Krippendorf's alpha is 0.71[11] for the agreement of the first author and the second independent coder concerning which advantage category an advantage coded by the first author should be grouped under, and 0.82 for the agreement concerning which disadvantage category a disadvantage coded by the first author should be grouped under. After the intercoder reliability test, the first author and the second independent coder jointly discussed their differences in coding in order to explain the differences. The second independent coder concluded that the demarcation of (dis)advantage categories in the 'coding and categorizing protocol' was clear; however, sometimes quotes by respondents were vague, leading to coding errors.

Next, we analyzed whether or not it can be determined that these coefficients (0.71 and 0.82) should lead us to the conclusion that the categorization of (dis)advantages into (dis)advantage categories is reliable. Lombard et al. (2002) state that there is no established standard for determining an acceptable level of reliability. Neuendorf (2002, p.145) reviews 'rules of thumb' set out by several methodologists and concludes that 'coefficients of 0.90 or greater would be acceptable to all, 0.80 or greater would be acceptable in most situations and below that, there exists great disagreement.' For instance Riffe et al. (2005) state that a coefficient of 0.667 would be appropriate for research that is breaking new ground with concepts that are rich in analytical value. We conclude that the intercoder reliability scores of the categorization of (dis)advantages into (dis)advantage categories are acceptable and is not the result of a purely subjective process based on one person's (the first author) choices.

Considering both the results of the first and the second phase of the intercoder reliability test, we conclude that the demarcation of categories as presented in tables 4 and 5 are reliable. However, we emphasize that the frequencies of CBA (dis)advantages mentioned should be interpreted with caution.

Table 4 presents – for each advantage category – the total number of respondents that mentioned that category, as well as the subdivisions by 'specialization' and 'profession'. Finally, the last column shows whether differences between groups regarding the number of times the advantage category was mentioned are significant ($p<0.05$). For instance, economists mentioned advantage category 2 'CBA results in a better decision-making process and better decision making regarding usefulness, necessity and design of a project' relatively more often compared to spatial planners[12].

[11] We learned from the first phase of the intercoder reliability test that it was very difficult for coders to decide whether a quote like 'CBA enhances transparency' should be categorized into advantage category 7 or 9 (see table 4). We calculated Krippendorf's alpha after clustering these two categories into the advantage category 'CBA enhances transparency'. As a result the Krippendorf's alpha improved to 0.76.

[12] Although we acknowledge that the frequencies are indicative, we believe that these differences are interesting to report because we have no reason to assume that the intercoder reliability scores are biased between economists and spatial planners.

Table 4: Key actors' perceptions of CBA advantages

Advantages	**Economist (EC) (44)**	**Spatial planner (SP) (17)**	**Transport expert (TE) (25)**		**Consultant (C) (19)**	**Scientist /Researcher(SR) (37)**	**Policy maker (PM) (30)**		**Total (86)**	
1: CBA enhances contemplation concerning the usefulness, necessity and design of a project.	**22 (50%)**	**10 (59%)**	**11 (44%)**		**12 (63%)**	**18 (49%)**	**13 (43%)**		**43**	
2: CBA results in a better decision-making process and better decision making regarding the usefulness, necessity and design of a project. This prevents the development of projects that have a negative impact on the welfare of a country.	**22 (50%)**	**3 (17%)**	**10 (40%)**		**8 (42%)**	**15 (41%)**	**12 (40%)**		**35**	EC > SP
3: CBA gives insight into the order of magnitude of different welfare effects and into the ratio of costs versus benefits of a project.	**14 (32%)**	**6 (35%)**	**9 (36%)**		**4 (21%)**	**16 (43%)**	**9 (30%)**		**29**	
4: CBA provides objective and independent information.	**24 (54%)**	**5 (29%)**	**3 (12%)**		**7 (36%)**	**17 (46%)**	**8 (27%)**		**28**	EC > TE
5: CBA enhances discussion concerning the usefulness, necessity and design of a project.	**12 (27%)**	**5 (29%)**	**7 (28%)**		**5 (26%)**	**11 (30%)**	**8 (27%)**		**24**	
6: A high quality CBA gives insight into the welfare effects for different relevant stakeholders (distribution effects).	**9 (20%)**	**2 (12%)**	**5 (20%)**		**4 (21%)**	**7 (19%)**	**5 (17%)**		**16**	
7: CBA makes the decision makers' decision more transparent for other stakeholders / CBA contributes to the justification of decisions.	**6 (17%)**	**3 (18%)**	**6 (23%)**		**4 (21%)**	**6 (16%)**	**5 (17%)**		**15**	
8: CBA provides standardized information.	**12 (27%)**	**1 (6%)**	**7 (28%)**		**3 (16%)**	**10 (27%)**	**7 (23%)**		**13**	
9: CBA makes the policy options more transparent for decision makers.	**9 (20%)**	**2 (12%)**	**1 (4%)**		**4 (21%)**	**5 (14%)**	**3 (10%)**		**12**	
10: Due to standardization, it is possible to compare the welfare effects of different projects.	**5 (11%)**	**1 (6%)**	**3 (12%)**		**2 (11%)**	**3 (8%)**	**4 (13%)**		**9**	
11: The Benefit-Cost Ratio communicates very powerfully.	**5 (11%)**	**1 (6%)**	**2 (8%)**		**2 (11%)**	**2 (5%)**	**4 (13%)**		**8**	
12: The Benefit-Cost Ratio is easy to use in the decision-making process.	**4 (9%)**	**0 (0%)**	**0 (0%)**		**1 (5%)**	**1 (3%)**	**2 (7%)**		**4**	
13: CBA provides the decision maker with high quality information.	**3 (7%)**	**0 (0%)**	**0 (0%)**		**1 (5%)**	**2 (5%)**	**0 (0%)**		**3**	
14: CBA encourages different stakeholders to cooperate.	**0 (0%)**	**2 (12%)**	**0 (0%)**		**0 (0%)**	**1 (3%)**	**1 (3%)**		**2**	

Table 4 shows that, based on the advantages mentioned by the respondents, we can distinguish fourteen different advantages of using CBA. Analyzing the different advantage categories we conclude that some advantage categories focus on positive characteristics of the CBA. For instance, advantage category 11: 'the Benefit-Cost Ratio communicates very powerfully'. Other advantage categories focus on a positive 'role' CBA can play in the decision-making process. For instance, key actors perceive the CBA as a proper tool to support decision making (category 2), a platform for discussion (category 5) and a platform for systematic information (category 8). Because key actors mentioned multiple 'positive role' advantage categories, we conclude that (according to Dutch key actors) CBA can have different (positive) 'roles' in the decision-making process.

Indicatively, we can see that the relatively important advantage categories (five advantage categories are coded in more than 20 interviews by the first author, but note the low reliability) seem to be:

- CBA enhances contemplation concerning the usefulness, necessity and design of a project;
- CBA results in a better decision-making process and better decision making regarding the usefulness, necessity and design of a project. This prevents the development of projects that have a negative impact on the welfare of a country;
- CBA gives insight into the order of magnitude of different welfare effects and into the ratio of costs versus benefits of a project;
- CBA provides objective and independent information;
- CBA enhances discussions concerning the usefulness, necessity and design of a project.

The advantage category most frequently coded by the first author was 'contemplation concerning the use, necessity and design of a project is enhanced due to CBA'. Respondents explained that the CBA stimulates actors in the Dutch decision-making process for spatial-infrastructure projects to very thoroughly contemplate the extent to which it is useful and necessary to develop the project. According to respondents, this contemplation frequently resulted in an improvement of the design of the project. In some cases the contemplation led to the insight that the initial project was not a very useful solution for the problems faced in the area, which resulted in the development of another type of project.

Table 5 presents – for each disadvantage category – the total number of respondents that mentioned that category, as well as the subdivisions by 'specialization' and 'profession'. Finally, the last column expresses whether differences between groups regarding the number of times the disadvantage category was mentioned are significant ($p<0.05$).

Table 5: Key actors' perceptions of CBA disadvantages

Disadvantages	**Economist (EC) (44)**	**Spatial planner (SP) (17)**	**Transport expert (TE) (25)**		**Consultant (C) (19)**	**Scientist / Researcher (SR) (37)**	**Policy maker (PM) (30)**		**Total (86)**	
1: An inherent limitation of CBA is that welfare effect estimates are always uncertain and contestable.	**12 (24%)**	**12 (71%)**	**12 (48%)**		**6 (32%)**	**14 (38%)**	**16 (53%)**		36	SP > EC
2: Some actors in the Dutch CBA practice position the CBA outcome – unintentionally or deliberately – as an instrument with too few limitations. As a result people attribute too much value to the CBA outcome. The position of the CBA is too strong.	**9 (20%)**	**12 (71%)**	**14 (56%)**		**5 (26%)**	**9 (24%)**	**21 (70%)**		35	SP > EC + TE, PM > C + SR
3: An inherent limitation of CBA is that not all welfare effects (and effects other than welfare effects) can be taken into account in a CBA.	**8 (18%)**	**13 (76%)**	**12 (48%)**		**7 (36%)**	**12 (32%)**	**14 (47%)**		33	SP + TE > EC

4: Actors in the Dutch CBA practice are aware of CBA limitations. However, they use the limitations strategically in the decision-making process by exaggerating or marginalizing them.	**13 (30%)**	**8 (37%)**	**9 (36%)**		**4 (21%)**	**14 (38%)**	**12 (40%)**		30	
5: The incorrect use of CBA in the decision-making process diminishes the quality of the decision-making process in regard to the usefulness, necessity and design of a project.	**12 (27%)**	**4 (24%)**	**12 (48%)**		**10 (52%)**	**9 (24%)**	**9 (30%)**		28	C > SR
6: Actors in the Dutch CBA practice are insufficiently aware of the limitations of CBA.	**12 (24%)**	**7 (41%)**	**5 (20%)**		**3 (16%)**	**12 (32%)**	**9 (30%)**		24	
7: Because the Benefit-Cost Ratio communicates very powerfully, many of the people reading CBA reports only read the summary and, therefore, are not aware of nuances that are communicated in the rest of the report.	**9 (20%)**	**7 (41%)**	**4 (16%)**		**4 (21%)**	**6 (16%)**	**10 (33%)**		20	
8: For users of the CBA it is difficult to understand the CBA limitations because they are presented in an insufficient way in the CBA report.	**5 (11%)**	**6 (35%)**	**8 (32%)**		**2 (11%)**	**10 (27%)**	**7 (23%)**		19	SP + TE > EC
9: Because the CBA systematics are very complicated, it is difficult to understand CBA limitations in the limited time users have to read the report.	**10* (23%)**	**4* (24%)**	**3* (12%)**		**4 (21%)**	**9 (24%)**	**4 (13%)**		17	
10: In the decision-making process, effects that are easy to quantify/monetize dominate over effects that are difficult to quantify/monetize.	**4 (21%)**	**5 (14%)**	**6 (20%)**		**9 (20%)**	**4 (24%)**	**2 (8%)**		15	
11: Some actors in the Dutch CBA practice position the CBA outcome – unintentionally or deliberately – as an instrument with too many limitations. As a result people attribute too little value to the CBA outcome. The position of CBA is too weak.	**3 (7%)**	**3 (18%)**	**9 (36%)**		**2 (11%)**	**4 (11%)**	**9 (30%)**		15	TE > EC
12: Effects that are easy to quantify/monetize dominate effects that are difficult to quantify/monetize in a CBA report.	**5 (11%)**	**3 (18%)**	**6 (24%)**		**3 (16%)**	**6 (16%)**	**5 (17%)**		14	
13: An inherent limitation of CBA is that some welfare effects are easier to quantify/monetize than other welfare effects.	**4 (9%)**	**3 (18%)**	**3 (12%)**		**2 (11%)**	**4 (11%)**	**4 (13%)**		10	
14: Carrying out a CBA takes time, money and effort.	**5 (11%)**	**2 (12%)**	**3 (12%)**		**1 (5%)**	**5 (14%)**	**4 (13%)**		**10**	
15: The incorrect use of CBA in the decision-making process diminishes the quality of discussions in regard to the usefulness, necessity and design of a project.	**3 (7%)**	**4 (24%)**	**1 (4%)**		**1 (5%)**	**4 (11%)**	**3 (10%)**		8	

Table 5 shows that, based on the disadvantages mentioned by the respondents, we can distinguish fifteen different disadvantages. A striking result of table 5 is that for some respondents the most important CBA disadvantage was that some actors in the decision-making process for spatial-infrastructure projects attribute too much value to the CBA outcome (category 2) whereas other respondents find a CBA disadvantage as being that some actors attribute too little value to the CBA outcome (category 11). Moreover, table 5 shows that ordinal logistic regression shows that the disadvantage categories 1, 2, 3 and 8 are mentioned relatively more often by spatial planners compared to economists.[13] In addition, we observe from table 4 and table 5 that the characteristic

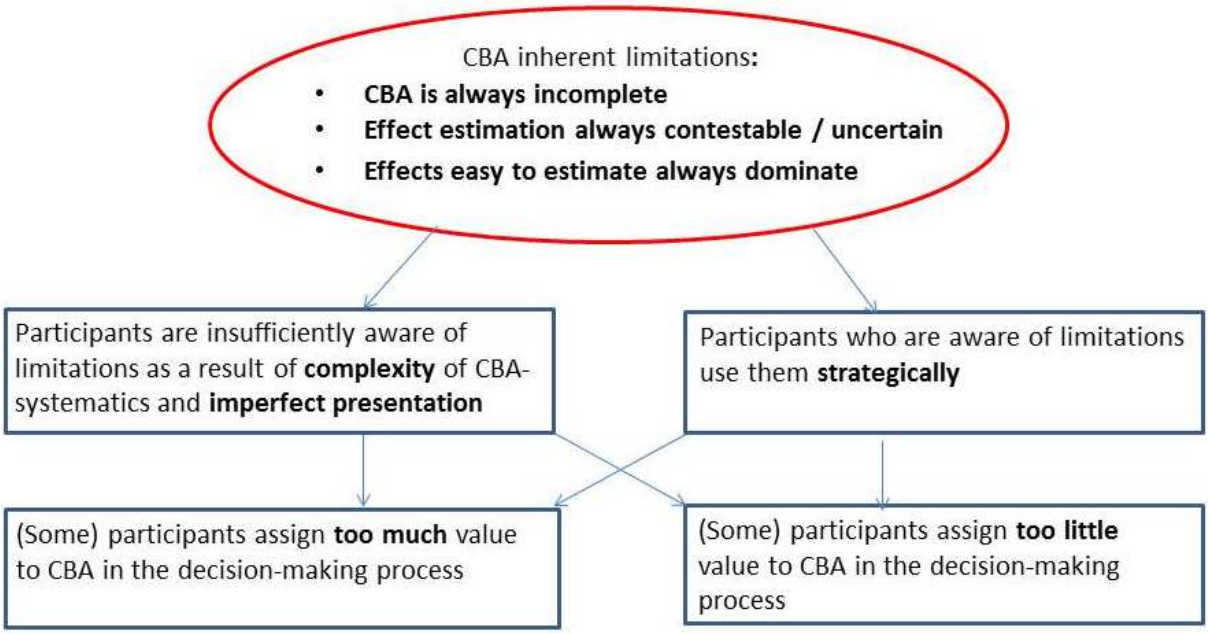
[13] We only discuss the categories that are mentioned relatively more often by spatial planners than economists because these categories can help by explaining controversies between these groups.

'the CBA ratio communicates very powerfully' is perceived both as an advantage (category 11, table 4) and as a disadvantage (category 7, table 5).

One result of the content analysis is that interviewed actors often linked different disadvantage categories when they were asked to express their most important CBA disadvantage. In particular respondents mentioned two three-step arguments.

In the first three-step argument (coded 22 times by the first author), actors start by mentioning that the CBA method has (an) inherent limitation(s). Disadvantage categories 1, 3 and 13 in table 5 represent the three different inherent limitations that are perceived by these respondents. In the second step of this argument the respondents state that (some) actors in the Dutch CBA practice are insufficiently aware of these limitations (disadvantage category 6), the two explanations for this insufficient awareness being disadvantage categories 8 and 9. In the third step respondents mention that, as a result of the insufficient awareness of CBA limitations, (some) decision makers assign either too much value or too little value to the CBA in the decision-making process (disadvantage categories 2 and 13). To illustrate this first three-step argument, one respondent states that *'Because the limitations of CBA (step 1) are poorly presented in the reports (step 2), some people are insufficiently aware of the limitations and think that the CBA ratio is equal to the definite answer to the question as to whether or not the project should be developed. They erroneously use CBA as a holy grail (step 3). On the other hand, skeptical people – as a result of an insufficient presentation of limitations in the CBA report (step 2) – easily lose their trust in its conclusions (step 3).'* The second three-step argument (coded 8 times by the first author) starts, like the first three-step argument, with the statement that the CBA method has (an) inherent limitation(s) (disadvantage categories 1, 3 and 13). Secondly, the respondents claim that (some) actors utilize these limitations strategically (disadvantage category 4). To illustrate this, a respondent states that '*if the CBA outcome does not support the political interest of a participant, the participant emphasizes the limitations of the method, and when the CBA outcome supports the political interest of a participant, the participant ignores its limitations*'. Thirdly, actors state that the result of this strategic behavior is that participants attribute either too much value or too little value to the CBA in the decision-making process (disadvantage categories 2 and 13). The two three-step arguments are illustrated in figure 1.

Figure 1: Illustration of the two three-step arguments mentioned by respondents



Some respondents discussed why they perceive it as problematic that some actors assign too much value to the CBA, whilst other actors assign too little value to the CBA. They perceive that debates on assigning too much or too little value to the CBA diminish the quality of discussions and decision making (disadvantage categories 5 and 15, table 5). In the interviews, respondents stated that the quality of discussions among actors on the usefulness of a new spatial-infrastructure project could diminish when the actors, in the process of discussing this project, chiefly focus their discussions on the perceived incorrect value that is assigned to the CBA. This leads to frustrations. Respondents stated that the contemplation, discussion and decision making on the usefulness, necessity and design of a spatial-infrastructure project is not enhanced when frustrations about a support tool for this contemplation, discussion and decision-making process dominate the debate.

4.2 Possible explanations for agreement and controversy

Agreement

We think that the agreement among key actors that CBA should have a role in the decision-making process can be clearly understood through the fourteen perceived advantage categories distinguished in this study. Analyzing the advantage categories we conclude that – according to the key actors – CBA can have multiple positive 'roles' in the decision-making process. Actors could have different views on 'the' role CBA should play in the decision-making process. However, it is plausible that every actor recognizes at least one 'positive role of the CBA', explaining why, in the written survey, 73 out of 74 respondents state that CBA must have 'a' role.

Controversy

Possible explanations for disagreement among Dutch key actors in regard to the role of the CBA in the decision-making process deserve a bit more attention.

Section 3.2 concludes that two groups of actors have opposing attitudes towards the role of CBA: economists (CBA's role is too weak) versus spatial planners (too strong). Our hypothesis is that this controversy is founded in the different assessments of CBA advantages and CBA disadvantages[14]. From the analysis of perceptions of advantages and disadvantages it can be seen that advantage category 2 (CBA results in a better decision-making process and better decision making) is mentioned relatively more often by economists compared to spatial planners. Moreover, our analysis shows that spatial planners mention four disadvantage categories more often than economists: category 1 (an inherent limitation of CBA is that effect estimations are always uncertain), category 2 (the role of CBA is too strong), category 3 (an inherent limitation of CBA studies is that they are always incomplete) and category 8 (the imperfect presentation of CBA limitations in the CBA report). Our hypothesis is that economists tend to think that a higher value should be assigned to CBA in the decision-making process compared to spatial planners because they perceive that the CBA can be used as a proper decision-support instrument, whereas spatial planners are more prone to view the CBA as an instrument with (poorly communicated) inherent limitations which should not play a too important role in the final decision about the development of the project. Spatial planners perceive CBA more as an instrument to contemplate the design of the project and a proper discussion platform which encourages different stakeholders to cooperate.

Perhaps three main reasons can explain these opposing attitudes. First, economists, through their education, are probably far more familiar with the theoretical pros and cons of CBA and, based on this knowledge, are more prone to give CBA results the benefit of the doubt in the final decision. In contrast, spatial planners are probably less educated in the use of CBA and welfare economics in general, resulting in more feelings of 'unknown, unloved' about CBA, compared to economists. This might explain why spatial planners, when compared to economists, view CBA as an instrument with 'a' role and not as 'the' instrument to support decision making. De Jong and Geerlings (2003) provide another, second, possible explanation for this difference in attitude. According to them, the specialty of spatial planners is to put into perspective the claims to the truth of each policy-relevant discipline and the type of information they supply (e.g. the economic discipline). As a consequence, spatial planners reject every absolute claim to the truth. After all, there are so many parties, so many interests, so many perspectives and so many views and concepts, constantly diverging and all claiming to have a monopoly on the truth. According to de Jong and Geerlings (2003), economists in Dutch practice – in contrast to spatial planners – tend to regard their approach and their instruments (e.g. CBA) as being able to encompass all relevant aspects of policy. Thirdly, some of the spatial planners interviewed perceive the presentation of an oversight of positive and negative effects to the decision maker as a useful role of CBA. However, they have a problem with the fact that CBA reduces effects to monetary terms followed by an aggregation of effects into an overall indicator (such as the Benefit-Cost Ratio). These respondents perceive that some effects (e.g. effects on traffic casualties and effects on biodiversity) should not be transferred into monetary terms because they are

[14] The difference in attitude between economists and spatial planners towards the role of CBA might be founded in the difference in their perception of (unsolved) substantive problems as well. However, Mouter et al. (2013) find that there is, in a broad sense, consensus among the different groups in the Dutch CBA practice concerning their perception of the seriousness of substantive problems and the way they rank substantive problems. Hence, our hypothesis is that the controversy between economists and spatial planners is not founded in a different perception of substantive problems.

incomparable with other effects, such as travel time savings.[15] According to the respondents, transferring incomparable effects into a common unit in the CBA report incorrectly communicates to decision makers that it is possible to outweigh negative effects on biodiversity, for instance, and positive effects on travel time savings, for instance. Our hypothesis is that economists have less problems than spatial planners with the CBA characteristic that effects are transferred as much as possible into monetary units, and therefore have a more positive attitude towards the value that should be assigned to the CBA (ratio) in the decision-making process than spatial planners.

5 Conclusions and discussion

The most important conclusion of this paper is that in the Dutch CBA practice there is agreement that CBA must have 'a' role in the appraisal process of spatial-infrastructure projects. However, despite this wide support for CBA, there is a lot of controversy among economists and spatial planners concerning the value that is and should be assigned to CBA in the decision-making process. Economists predominantly believe that too little value is assigned to the CBA in the decision-making process, whereas spatial planners predominantly think that too much value is assigned to the CBA. Both economists and spatial planners believe that this controversy is problematic as it results in debates about the pros and cons of CBA instead of the pros and cons of the spatial-infrastructure projects. We think that this result is noteworthy and surprising for two reasons. First, we did not expect that even the respondents who were known as CBA-antagonists are not opposed to the use of CBA completely, but are 'only' against attributing too strong a value to CBA in the decision-making process. Second, we think it clearly clarifies that an actor's 'specialism' is more decisive for explaining his/her attitude towards the value that is assigned to CBA in the decision-making process than his/her 'profession'.

Next, we discuss three topics based on our results. The first one concerns solutions to overcome the controversy among economists and spatial planners. In the second topic we discuss some suggestions for further research. The third topic is about the limitations of this study.

The use of CBA in a 'subtle' way as a solution

From this paper it can be deduced that economists and spatial planners perceive that actors other than themselves in the Dutch CBA practice assign a value that is too absolute or too marginal to CBA results in the decision-making process regarding spatial-infrastructure projects and that this is problematic. Although we did not ask respondents to mention solutions for this problem in a systematic way, in some interviews there was time to discuss solutions. Respondents mentioned two ways for arriving at a solution. First, some stress the importance of politicians communicating – more than they do at present – that they will assign an important but, at the same time, not too absolute value to the CBA in the decision-making process for a specific spatial-infrastructure project. According to these actors, this political view might result in a more 'subtle' behavior by actors in the Dutch CBA practice towards each other, through which they will not (endlessly) fight each other over the proper value that should be assigned to CBA in the decision-making process but will try more to

[15] 'Incomparability issues' are discussed in the literature as well. See for instance: Adler (1998), Aldred (2002), Hansson (2007) and Naess (2006).

help to facilitate the decisions about proper projects. Second, in the interviews some respondents state that improving the communication of inherent limitations (especially uncertainty - table 5, disadvantage category 1) in CBA reports could enhance the 'subtle' use of CBA in decision-making processes regarding spatial-infrastructure projects. Some respondents even claim that this solution is 'the salvation' of the CBA in the Netherlands because it will effectively reduce absolute use of the method.

Thus, some respondents state that CBA reports should communicate CBA limitations more prominently (see before). However, other respondents – who had the time to discuss solutions in their interview – perceive that communication of inherent limitations that is too prominent eventually leads to 'the collapse' of the instrument in the decision-making process. One respondent states that *'the instrument is dead when the report emphasizes the inherent limitations of the method.'* Interviewees perceive two risks from too much emphasis on CBA limitations. First, they perceive that politicians will not use a CBA report that communicates an uncertain message because politicians will not consider this as useful information and certainly not as a solid basis for decision making.

The second risk mentioned is that some interviewees fear that a CBA deteriorates into a 'toothless' instrument when politicians and the CBA report put too much emphasis on CBA limitations. They state that the threat of the national government to assign a significant value to the CBA is an incentive for local authorities to optimize project proposals, which compete for limited resources provided by the national government for spatial-infrastructure projects. Beukers et al. (2012) confirm that spatial planners in the Dutch CBA practice perceive that the national government (in particular the Ministry of Finance) assigns a significant value to the CBA outcome and that a negative CBA balance (ratio below 1) could lead to disapproval of subsidies for the project. This practice also seems to apply in Sweden (Eliasson and Lundberg, 2012, p. 46): *'the mere fact that CBA would be used as a prioritization instrument made planners 'trim' proposed investments by trying to reduce investment costs without significantly reducing benefits. In other words, the mere awareness that CBA would be used as a prioritization instrument made investment suggestions more cost-efficient*'. So, although the threat of the national government to assign a significant value to the CBA outcome may result in some frustrations for local authorities, it simultaneously motivates them to optimize the design of the project. Hence, a conceivable disadvantage of a CBA with too much emphasis on CBA limitations is that this could take the sting out of the instrument. A 'toothless' CBA does not motivate local or other authorities to contemplate the optimal design of spatial-infrastructure projects (table 4, advantage category 1).

In our view, this discussion point means that further research on solutions for enhancing 'subtle' use of CBA in the decision-making process is required. We think that solutions must on the one hand enhance the communication of CBA limitations (especially uncertainty) regarding CBA results in, for instance, the CBA report. On the other hand one must be cautious when communicating CBA limitations in a wrong ('unsubtle') way, in order to prevent the risk that the CBA will no longer be used in the decision-making process or that it becomes a 'toothless' instrument. Next, we think that more solutions to enhance 'subtle' use of CBA than the solutions mentioned by respondents could be scrutinized in further research. Firstly, we believe, that more explicit communication on 'the role' that CBA should play according to different actors in a specific decision-making process is an interesting solution to be researched. In the status quo, situations in which

different actors agree to carry out a CBA for different purposes (for instance, the spatial planner to use the CBA as a discussion platform and the economists to support the final decision) could lead to confusion and frustrations when actors only implicitly disagree about 'the' role. It would be interesting to study whether explicit communication of this difference of opinion might lead to mutual understanding (agree to disagree) and a more 'subtle' use of CBA. Secondly, we think it would be interesting to study whether a more prominent communication of CBA advantages and limitations to actors in, for instance, guidelines, publications and fact sheets might enhance 'subtle' use. Our hypothesis is that the probability that people assign a value that is too absolute or too marginal to CBA in a discussion diminishes when actors participating in a discussion are aware of both CBA advantages and CBA limitations.

Further research on understanding and enhancing specific roles of the CBA

Based on our analysis of perceived CBA advantages, we conclude that key actors distinguish multiple (positive) roles that the CBA can play in the decision-making process for spatial-infrastructure projects. For instance: for contemplating the design of the project, for being a discussion platform and for supporting 'go' or 'no go' decisions. Another finding of this study is that there is controversy among economists and spatial planners concerning the assessment of advantages and disadvantages of CBA compared to MCA to support 'go' or 'no go' decisions. We emphasize that one should be careful when concluding that economists and spatial planners weight the advantages and disadvantages of CBA compared to MCA differently for all roles of CBA or MCA. It is possible that both spatial planners and economists perceive that CBA is a more appropriate method than MCA for facilitating other roles in the decision-making process. We think this is an interesting topic for further research. Moreover, we think it is interesting to analyze more thoroughly which roles spatial planners and economists both perceive as 'appropriate roles' of the CBA, why they think some roles are inappropriate and whether they perceive that the appropriateness of the 'role of the CBA' is related to the phase of the decision-making process. Do spatial planners, for instance, consider 'weeding out projects with very negative CBA scores in the early planning phase' as appropriate and sustaining the final 'go' or 'no go' decision predominantly on the CBA results as inappropriate?

Moreover, we think it is worthwhile scrutinizing the advantages and disadvantage of a hybrid model (which combines CBA and MCA) compared to the single use of only a CBA or MCA in further research. Recent literature (e.g. Ambrasaite et al., 2011; Barfod et al., 2011; Grant Muller et al., 2001; Gühnemann et al., 2012; Quinet, 2010; Thomopoulos and Grant Muller, 2012; van Wee, 2012) states that although MCA is often seen as competing with CBA, both approaches may be used in an entirely complementary manner within an overall framework or a hybrid model. We think that a hybrid model could have clear advantages, especially when it is not possible to take important project effects into account in a CBA because it is not possible to estimate or monetize effects in a reliable way. However, we think that the (actors' perceptions of) advantages and disadvantages of a hybrid model have not yet been researched extensively and that this is an interesting subject for further research.

Politicians underrepresented, results are limited to Dutch key actors and low intercoder reliability

Although politicians are key actors in the decision-making process regarding spatial-infrastructure projects and they have to make a decision – informed by a CBA – about the

development of a spatial-infrastructure project, only two politicians were interviewed in this study. The reason for this was that key actors in the Dutch CBA practice only mentioned four (ex) politicians as people that needed to be interviewed in order to make sure that the entire population of key actors in the Dutch CBA practice was interviewed and two of the suggested (ex) politicians had no time for an interview (see Mouter et al., 2013 for more information regarding the selection of respondents). On the one hand one could interpret this observation as a limitation of this study. On the other hand there is some evidence in the literature that politicians are in fact relatively unimportant actors in CBA practice (e.g. Eliasson and Lundberg, 2011; Sager and Ravlum, 2005). Nevertheless, we think it is interesting to scrutinize the attitudes of (Dutch) politicians towards the role of CBA in further research.

A second limitation of this study is that results are limited to key actors in the Dutch CBA practice and are not necessarily applicable to CBA practices in other countries. Several studies (e.g. Grant Muller et al., 2001; Hayashi and Morisugi, 2000; Odgaard et al., 2005; Quinet, 2000; Rothengatter, 2000; Vickerman, 2007) revealed differences between CBA practices. In the literature we find contributions which reflect differently on the role of CBA in the decision-making process in France and the value that must be assigned to CBA (e.g. Damart and Roy, 2009; Hyard, 2012; Quinet, 2000). Moreover, Veisten et al. (2010) found, amongst other things, that European road-safety decision makers that consider themselves economists have a more positive attitude towards the use and usefulness of CBA than the decision makers that did not consider themselves economists. For further research we suggest replicating this research in other countries that use CBA and compare the results with this study.

We regard the low scores of the first phase of the intercoder reliability test as a third limitation of this study. We regard the 'ranking of CBA advantages and CBA disadvantages' by key actors in a CBA practice as an interesting topic for further research.

Acknowledgment

The authors wish to thank Diana Vonk Noordegraaf and Marc Holleman (Delft University of Technology) for carrying out the intercoder reliability test, as well as the 86 respondents for their open-heartedness. Moreover, we wish to thank three anonymous reviewers for their useful comments.

References

Adler, M., 1998. Incommensurability and Cost-Benefit Analysis. University of Pennsylvania Law Review 146 (5), 1371-1418.

Aldred, J., 2002. Cost-benefit analysis, incommensurability and rough equality. Environmental Values 11, 27-47.

Ambrasaite, I., Barfod, M. B., Salling, K.B., 2011. MCDA and Risk Analysis in Transport Infrastructure Appraisal: the Rail Baltica Case. Procedia Social and Behavioral Sciences 20, 944-953.

Annema, J.A., Koopmans, C., Van Wee, B., 2007. Evaluating transport infrastructure investments: the Dutch experience with a standardized approach. Transport Reviews 27 (2), 125-150.

B&A Consultants (2010). Evaluatie maatschappelijke kosten- en batenanalyses nota ruimte Budgetprojecten (In Dutch), The Hague: B&A groep.

Barfod, M. B., Salling, K.B., Leleur, S., 2011. Composite Decision Support by Combining Cost-Benefit and Multi-Criteria Decision Analysis. Decision Support Systems 51, 167-175.

Beukers, E., Bertolini., Te Brömmelstroet, M., 2012. Why cost-benefit analysis is perceived as a problematic tool for assessment of transport plans: a process perspective. Transportation Research Part A 46 (1), 68-78.

Buck Consultants International, 2002. Evaluatie OEEI-leidraad (In Dutch). The Hague. Buck Consultants.

Damart, R. and Roy, B. 2009. The uses of cost-benefit analysis in public transportation decision-making in France. Transport Policy 16 (4), 200-212.

Eijgenraam, C. J. J., Koopmans, C.C., Tang, P.J.G., Verster, A.C.P., 2000. Evaluation of Infrastructural Projects; Guide for cost-benefit analysis, Sections I and II, CPB, The Hague, NEI (Changed Name to ECORYS), Rotterdam.

Eliasson, J. and Lundberg, M., 2012. Do Cost-Benefit Analyses Influence Transport Investment Decisions? Experiences from the Swedish Transport Investment Plan 2010-21. Transport reviews 32 (1), 29-48.

Frank, R.H., 2000. Why is Cost-Benefit analysis so controversial? Journal of Legal Studies vol. XXIX, 913 – 930.

Grant-Muller, S., Mackie, P., Nellthorp, J., Pearman, A., 2001. Economic appraisal of European transport projects – The state of the art revisited. Transport Reviews 21 (2), 237-261.

Gühnemann, A., Laird, J.J., Pearman, A.D., 2012. Combining cost-benefit and multi-criteria analysis to prioritise a national road infrastructure programme. Transport Policy 23, 15-24.

Hamers, D., Bijlsma, L., Hoorn, V.A., 2012. The plan review: a new approach to urban project assessment. AESOP 26th Annual Congres. 11.15 July 2012. Ankara

Hansson, S.-O., 2007. Philosophical problems in cost-benefit analysis. Economics and Philosophy 23 (2), 163-183.

Hayashi, Y., and Morisugi, H., 2000. International comparison of background concept and methodology of transportation project appraisal. Transport Policy 7 (1), 73-88.

Hyard, A., 2012. Cost-benefit analysis according to Sen: An application in the evaluation of transport infrastructure in France. Transportation Research A 46 (4), 707-719.

Jong., D.M., Geerlings, H., 2003. Exposing weaknesses in interactive planning: the remarkable return of comprehensive policy analysis in The Netherlands. Impact Assessment and Project Appraisal 21 (4), 281-291.

Krippendorff, K., 2004. Content analysis: an introduction to its methodology. Sage Publications Ltd. London.

Lohmann, L., 1997. Cost-benefit analysis: whose interest, whose rationality? London: The corner house.

Lombard, M., Snyder-Duch, J., Bracken, C.C., 2002. Content analysis in mass communication: Assessment and reporting of intercoder reliability. Human Communication Research 28, 587-604.

Lombard, M., Snyder-Duch, J., Bracken, C.C., 2004. Practical Resources for Assessing and Reporting Intercoder Reliability in Content Analysis Research. Retrieved April 2008, 2004.

Mackie, P., 2010. Cost-Benefit Analysis in Transport: A UK Perspective. International Transport Forum, Mexico.

Ministry of transport and water management and Ministry of housing spatial planning and the environment, 2009. Spelregels van het Meerjarenprogramma Infrastructuur, Ruimte en Transport (In Dutch). The Hague: Ministry of transport and water management & Ministry of housing, spatial planning and the environment.

Mouter, N., Annema, J.A., Van Wee, B., 2013. Ranking the substantive problems in the Dutch Cost-Benefit Analysis practice. Transportation Research Part A. 49. pp 241-255

Mouter, N., Vonk Noordegraaf, D., 2012 Intercoder reliability for qualitative research. You win some, but do you lose some as well? TRAIL Conference 2012. TRAIL Research School.

Naess, P., 2006. Cost-benefit analysis of transportation investments. Neither critical nor realistic. Journal of critical realism 5 (1), 32-60.

Nellthorp, J., Mackie., P., 2000. The UK Roads Review – a hedonic model of decision making. Transport Policy 7 (2), 127-138.

Neuendorf, K.A., 2002. The content analysis guidebook. Thousand Oaks, CA: Sage.

Nguyen-Hoang, P. and Yeung, R., 2010. What is paratransport worth?. Transportation Research Part A 44 (10), 841-853.

Nyborg, K., 1998. Some Norwegian politicians' use of cost-benefit analysis. Public Choice 95, 381-401.

Odeck, J., 1996. Ranking of regional road investment in Norway. Transportation 23 (2), 123-140.

Odeck, J., 2010. What determines decision-makers' preferences for road investments? Evidence from the Norwegian road sector. Transport reviews 30 (4), 473-494.

Odgaard, T., Kelly, C., Laird, J., 2005. Current practice in project appraisal in Europe, in: Proceedings of the European Transport Conference. 3-5 October, Strasbourg, Association for European Transport.

Quinet, E., 2000. Evaluation methodologies of transportation projects in France. Transport Policy 7, 27-34.

Quinet, E., 2010. The practice of cost-benefit analysis in transport: The case of France. International Transport Forum, Mexico.

Riffe, D., Lacy, S., Fico, F.G., 2005. Analyzing media messages: Using quantitative content analysis in research. Mahwah, NJ: Lawrence Erlbaum Associates.

Rothengatter, W., 2000. Evaluation of infrastructure investments in Germany. Transport Policy 7 (1), 17-25.

Saelensminde, K., 2004. Cost-benefit analysis of walking and cycling track networks taking into account insecurity, health effects and external costs of motorized traffic. Transportation Research Part A 38 (8), 593-606.

Sager, T., Ravlum, I.A., 2005. The political relevance of planners' analysis: the case of a parliamentary standing committee. Planning Theory 4 (1), 33-65.

Salling, K.B., Banister, D., 2009. Assessment of large transport infrastructure project: the CBA-DK model. Transportation Research Part A 43 (9), 800-813.

Sen, A.K., 2000. The discipline of cost-benefit analysis. The journal of Legal Studies 29 (2), 931-952.

Ševcíková, H., Raftery, A.E., Waddell, P.A., 2011. Uncertain benefits: application of Bayesian melding to the Alaskan way viaduct in Seattle. Transportation Research Part A 45 (6), 540-553.

Shapiro, S., 2010. The evolution of Cost-Benefit Analysis in U.S. Regulatory Decision making. Jerusalem Papers in Regulation & Governance, Working Paper No. 5, Jerusalem: The Hebrew University Mount Scopus.

Sunstein, C.R., 2000. Cognition and Cost-Benefit Analysis, Journal of Legal Studies vol. XXIX, 1059 – 1103.

Tudela, A., Akiki, N., Cisternas, R., 2006. Comparing the output of cost benefit and multi-criteria analysis: an application to urban transport investments. Transportation Research Part A 40 (5), 414-423.

Veisten, K., Elvik, R., Bax, C., 2010. Assessing conceptions of cost-benefit analysis among road safety decision-makers: misunderstandings or disputes? Impact Assessment and Project Appraisal 28 (1), 57-67.

Vickerman, R., 2007. Cost-benefit analysis and large-scale infrastructure projects: state of the art and challenges. Environment and Planning B 34, 598-610.

Wee, V. B., 2012. How suitable is CBA for the ex-ante evaluation of transport projects and policies? A discussion from the perspective of ethics. Transport Policy 19 (1), 1-7.

World Bank., 2010. Cost-Benefit Analysis in World Bank Projects. Washington D.C.: The International Bank for reconstruction and development/The World Bank.*