

## Public Transport Authorities' Use of Cost-Benefit Analysis in Practice

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CTS Working Paper 2017:8

### *Abstract*

Public transport services in Sweden are in 2016 worth over 40,000 million SEK annually, and the planning is carried out mostly by the Public Transport Authorities (PTA). Given the national goals for transport and infrastructure, economic efficiency is essential also in public transport operations. In 2003, Ljungberg (2007) sought to answer to which extent PTAs use Cost-Benefit Analyses (CBA), a methodology to assess economic efficiency, in their planning of operations and infrastructure. It was found that CBA is seldom used. This paper tries to answer the same question, but for the year 2016. The aim is, like Ljungberg (2007), to see to what extent PTAs are using CBA today, but also to investigate whether there have been any changes compared to the previous study.

A survey was sent to all Swedish PTAs with questions regarding current, previous, and projected future use of CBA. Questions about knowledge of reference materials and why the organization use (or do not use) CBA was asked. The main results are that most PTAs are not using CBA as decision support. For those who does, the method is used mostly for investments in payment systems and major line or traffic changes. When comparing the usage of CBA across different investment categories, the only statistically significant change from the 2003-study is an increased usage when changing fare structure. The PTAs seem not regard a lack of economic resources a reason for not using CBA. Rather, lack of knowledge and more reliance on other types of decision support are the reasons.

Keywords: Cost Benefit Analysis; Economic efficiency; Survey; CBA usage; Decision support

*JEL Codes:* D61, L98, L91, C83

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# 1 Introduction

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The insight that commercial actors for various reasons will not provide public transport services at the socially optimal level (the Mohring effect) is perhaps the most important argument for having a public intervention and subsidized supply of such services (De Palma, Lindsey, Quinet, & Vickerman, 2013), usually provided by the Public Transport Authorities (PTA). In addition, a well-designed public transport system gives rise to additional positive externalities such as increased mobility for various groups in society and option value for users of other transport modes, and reduces negative externalities such as pollution and road congestion (De Palma, Lindsey, Quinet, & Vickerman, 2013; Nilsson J.-E., 2011). On average, 52 percent of the total costs of local and regional public transport in Sweden is financed by local (county) taxes. The subsidization is ranging from 28 to 74 percent among the 21 PTAs (Transport Analysis, 2016a). Also, infrastructure as road, rail, stations, and trams are also publicly financed. Social benefit and efficiency should be the core of publicly subsidized public transport, and the latter is also an important overall goal for the Swedish government's transport strategy. Even though many decision supports indirectly considers social efficiency, it is not clear to which extent the PTAs have social benefits as a part of their decision supports, for example through Cost-Benefit Analyses (CBA).

The purpose of this study is to investigate to which extent the Swedish PTAs are using CBA as part of their decision support, and what importance it potentially have in different parts of the public transport provision. Usage can, in this context, involve both conducting the CBA, but also the process of using the CBA framework in the decision process. Further, why, or why not, CBA is part of the decision support is investigated. The present study is an extension of the work published in Ljungberg (2003) and Ljungberg (2007) where the same issue was investigated under the year 2003. Some results from the previous study are presented in more detail in the next section.

There is an extensive literature modeling transport systems to find a socially optimal supply of transport services for different scenarios, studies calculating the optimal public transport subsidy, taxes for emissions, congestion and more, and papers with the generalized travel time cost in focus. For an introduction, overview, and extension of these issues, see the *Handbook of Research Methods and Applications in Transport Economics and Policy* (Nash, 2015). For an introduction and theoretical explanation of CBA, see for example Pearce & Nash (1981) and Zerbe & Dively (1994) explaining the CBA methodology from two perspectives. However, the number of studies investigating Public Transport Authorities' use of this methodology is highly limited. Related studies in other fields within and outside public transport are, however, available.

Nilsson et. al. (2008) analyze the use of policy appraisal tools in Germany, Sweden, the UK, and European Commission (EC) and find that the use of advanced tools is limited. However, the use of formal tools, which contains amongst others CBA, was more common, not the least for Sweden and the EC. The authors also note that the use of formal models might be limited by the political process. Nerhagen & Forsstedt (2016), in reviewing the literature, note that implementation of regulatory impact assessment (RIA) is lagging behind in Sweden. Turnpenny et. al. (2015) find that the guidance and use of policy tools vary across countries in Europe, and Hahn & Dudley (2007) for the US find that RIA lacks detailed economic information and that quality varies across CBAs carried out. Although not being the focus of this paper, civil servants' preferences and how the same could affect advice given to decision makers is a related topic. Some studies on this topic are Carlsson, Mitesh & Lampi (2011) and Van der Wal (2016).

Looking at other transport authorities' use of CBA in Sweden it should be mentioned that the Swedish Transport Administration have the overall responsibility to administer and develop the CBA-methods to be used within the transport sector. The responsibility covers all modes of transport, for both passenger and freight and includes CBA-principles, methods, values, transport forecast models and other calculating tools (Swedish Transport Administration, 2016; Transport Analysis, 2016b). The methods and tools are used for both regulatory changes and both small and large infrastructure investments. However, the tools are mainly developed to be used for road and rail investments financed by the public sector. The outcome from the CBAs, however, seldom guide the selection of infrastructure projects in the political process (Eliasson & Lundberg, 2012). When it comes to doing CBAs for regulatory changes, it is found that the Swedish Transport Agency are trying to implement it and use it, but that the quality of the analyses raises concerns (Forsstedt & Nerhagen, 2016).

## 2 The previous study

The main conclusions of the 2003 study are drawn from a paper questionnaire delivered to the 21 PTAs. This study included initial interviews with all PTAs, as well as with some other relevant agencies and, at that time, municipalities with responsibility for public transport. In all the questionnaire included four sections of questions with a total of 24 questions, were the results of the questions in the section about the usage of CBA appraisal for different measures are shown in Table 1.

As reported in Ljungberg (2003), the yes column in Table 1 is mainly dominated by the three largest PTAs in Stockholm, Västra Götaland (Gothenburg-region), and Skåne (Malmö-region). To note also is that ten PTAs are never using CBA or do not consider the measure to be their area of responsibility. They are mainly located in the northern part of Sweden, or other sparsely populated counties. However, two PTAs with a large population and a large public transport supply are among these ten.<sup>1</sup>

	Yes	Some-times	No	Not resp.*	No answer	Total	
Operation and maintenance tasks	1	1	14	5	0	<b>21</b>	
Labor changes	0	0	18	3	0		
Investments in information systems	2	6	12	1	0		
Investments in vehicles	2	5	7	7	0		
Changes in fare structure	1	1	19	0	0		
Minor line or traffic changes	1	2	18	0	0		
Major line or traffic changes	3	4	14	0	0		
Investments in bus stops and stations	5	5	8	3	0		
Investments in rail and tram infrastr.	4	0	3	14	0		
<b>Average</b>	<b>2</b>	<b>3</b>	<b>13</b>	<b>4</b>	<b>0</b>		<b>21</b>

\* Not the responsibility of the PTA.

**Table 1 - Usage of CBA appraisal in the 2003 study**

Another question of interest to report here is a question with two alternatives, a portal question: "CBA is never used, or used to a very small extent" and "CBA is often, or not seldom, used", were 19 chose the first alternative, and two chose the second (Västtrafik

<sup>1</sup> These two are Östgötatrafiken and Upplands Lokaltrafik. Östgötatrafiken write in their questionnaire that to do CBA is "*perhaps more a question for our owners*", and Uppland Lokaltrafik mention that they would like to (and will) start to use CBA.

and Stockholm). Depending on which of the alternatives was chosen, the respondent was faced with a different set of questions. The respondents never using CBA or using it to a small extent were given three statements, as seen in Table 2. Four only made a mark for one assertion, and 15 respondents answered the question completely. A large share of the respondents claims that there is, at least partly, a lack of economic resources to carry out CBA. However, other factors seem, in the PTAs view, to have a greater importance when decisions about investments are made, and other decision support seems to be good enough for their organizations.

	Fully	Partly	Indiff- erent	Not very	No at all
There is a lack of economic resources to carry out a CBA	2	8	5	1	2
Other factors than CBA are more important for our decisions	7	6	0	2	0
Our current decision support is enough for our organization	7	3	5	1	0

**Table 2- Reasons for not using CBA for the 19 of total 21 PTAs that never use CBA or use it to a very small extent in the 2003 study**

For more details about, and results from, the previous study, see Ljungberg (2003) and Ljungberg (2007). Some conclusions from the 2003 study are however that a large majority (76 percent) of the PTAs mean that they are informed about the latest version of relevant CBA-manual. CBAs are also made quite regularly in Stockholm and Västra Götaland mainly for infrastructure investments. Other PTAs seemed to use it only occasionally, except for projects financed by the central government requiring CBAs. Finally, it also seemed as if some civil servants and politicians did not believe the use of CBA was relevant in their organizations. Some PTAs were, however, interested in starting to use CBA once they would be considered more in decision making. More development on CBA calculations for local and regional public transport was also said to be needed.

### 3 Methodology

This paper uses a survey like the one in Ljungberg (2003), which is distributed to all PTAs and its potential traffic companies. A traffic company in this context is a subsidiary of the PTA, to which the latter has handed over some or all of the responsibility of providing public transport services. An example of this setup is found in the county of Skåne, where the county Region Skåne gives the transport provision responsibility to the traffic company Skånetrafiken. Thus, there are in practice two entities with the practical operations carried out by Skånetrafiken and many infrastructure issues taking place by the Region Skåne.

The survey contains, broadly, four sections with up to 27 questions: background knowledge of CBA methodology, to which extent the PTA uses CBA today, if CBA is to be used or has been used in future or previous investments, and what the reasons for the PTA's usage, or non-usage, of CBA are. The sections are presented in more detail below, and the full survey is found in Appendix A (for an English version, see Appendix B).

The first section asks three questions about whether the PTA's organization has knowledge about three reports related to CBA methodology in general, and for public transport appraisal in particular. The first is the Partner Co-Operation for Enhanced

Public Transport's<sup>2</sup> guidance for social benefits (Partner Co-Operation for Enhanced Public Transport, 2016), which is a guidance targeted towards the PTAs specifically with information about what CBA is, and how the organization can integrate it in its decision process. The second report is the Swedish Transport Administration's (STA) material on cause-and-effect relationships (effektsamband) (Swedish Transport Administration, 2015). These are all relevant, and the two latter more important, texts for Swedish transport appraisal. The final report is the STA's ASEK<sup>3</sup>-guidelines (Swedish Transport Administration, 2016) containing recommended principles for doing CBA and costs, prices, and shadow prices to use in appraisal in the transport sector. Section two asks whether CBA is used as decision support in eleven different operation and investments areas. These are, in order of appearance, operations and maintenance tasks, labor changes, investments in information systems, payments systems, and vehicles, changes in fare structure, major and minor traffic changes, investment in bus stops, stations, and, lastly, investments in rail and tram infrastructure. The respondent is given the alternatives "yes", "sometimes", "no", "not our responsibility", and "prefer not to answer". The two latter is included to avoid dubious answers that might arise because the PTA does not hold that responsibility, or if it prefers not to answer the questions. In the former case, the PTA might answer no, which is only partly correct. The questions are chosen mainly with respect to the 2003-study, with some additions and alterations. These are described in more detail in Section 3.1.

The third section relates to the responding organization's previous and future investments. The PTA is asked to list the largest previous and future projects, the approximated cost of the same, and whether CBA was/is used.

The questions in the fourth section differ depending on the respondent's answer to a portal question. Depending on this answer, the PTA will answer questions relating to why it does not use CBA to any greater extent, or why CBA is used in the case that the PTA regards itself to use it to not a small extent. The purpose of the questions is to get more information to why the organization uses CBA the way it does and could give inferences to how to get more PTAs to use CBA if that is wished for.

In addition to checkbox and number questions, an optional text answer field in each section but the first allow for additional information or comments from the respondents. These were added to allow the respondents to reflect on the question, or add more information than was asked for and are thought to, potentially, give more insight into the reasoning of the PTA, and give further understanding to why it acts as it does.

The survey has been distributed during the first four months of the year 2016 to the 21 Swedish PTAs and in some cases their traffic companies. Appendix C lists the answering organizations. In the recruitment process, phone contact has first been established with the head of the PTA in the county to describe the study and find out a proper respondent in the organization. In the case the head of the PTA passes on the survey to another person, a similar routine with the new respondent has been made. The survey has then been sent by mail to the respondent who has had the possibility to answer either by the web or (identical) paper survey. The reason for using the two formats has been to achieve a high convenience for the PTA, thus increasing the response rate. In both the phone contact, and in the survey, it has been emphasized that the answers should reflect the organization's use of CBA, not the single person's usage and

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<sup>2</sup> Partnersamverkan för en Förbättrad Kollektivtrafik (tidigare Fördubblad Kollektivtrafik).

<sup>3</sup> Analysmetod och samhällsekonomiska kalkylvärden för transportsektorn.

knowledge. This is to avoid personal reflections on the issues, and rather have answers from an institutional perspective. If there seem to be ambiguity in an answer, the authors' try to state this in relation to the comment.

### 3.1 Changes from the previous study

Compared to the previous survey, some features have been added, and some changes have been made. While it is good from a comparison perspective to keep the two surveys identical, the changes are made to get more detailed answers, and because the technical development in the transport sector has taken a leap forward in the last decade.

The first change is made on the question "Investment in stations". Because of the phrasing of the question in the previous survey, no distinction was made between stations and bus stops, which creates ambiguity. In the new survey, the question is split to separate these two types of pick-up places. When comparing the two surveys later, the changes with respect both "Investments in stations", and the total responses to this question and the "Investments in bus stops" is shown.

Because of the technical leaps taken in the public transport sector the last decade, a new question is added asking whether the PTA has considered social welfare when investing in payment systems. Many PTAs have made investments in such systems during the last couple of years, and some are about to reinvest in already existing systems. Adding this question should not have any implications on the answers to the other questions.

Finally, the survey is distributed to more organizations in the new study. The primary reason for doing this is that the organization of the public transport sector has changed since 2003, following the new Swedish law of public transport (SFS 2010:1052). The new law formed new administrative bodies in the counties, which often kept the previous traffic company as well. Due to this, more institutions are involved in the public transport provision and thus more potential respondents. Because of the larger sample, a statistical methodology is used to evaluate whether PTAs have changed in their use of CBA, which is discussed next.

### 3.2 Statistical methodology for comparing previous results

One of the purposes of this study is to see whether the PTAs' use of CBA has changed since the 2003-study. The compared categories are the ones that correspond fully to the categories in the 2003-study's in question two, excluding the category "other". In total, nine categories are compared and listed in Section 4.1.

To analyze whether the results in the new study differ from the 2003-study, a non-parametric statistical method is applied using the old and new survey responses. Because all answers are on a nominal scale (yes/no), a standard chi-square test is deemed appropriate. A test statistic significant at the ten percent level or lower will indicate a difference in the use of CBA in that particular category (for example, more yes-answers in the 2016-study, compared to the 2003-study), and the direction (more or less use) is determined by the sign of the statistic. In the tests, all answers indicated with "yes" and "sometimes" will be grouped together as "yes", indicating there is some use of CBA in the organization for that particular category. This gives a somewhat weaker indication of to which extent CBA is used, but it is argued that answering "sometimes" actually indicates usage. For completeness, results using "yes"-answers strictly are presented as well.

## 4 Results

The survey was distributed to 24 organizations, 21 PTAs, and three traffic companies, of which all gave complete answers to the mandatory questions. Thus, a 100 percent answering rate is achieved. Three respondents chose to use the paper survey. In the remainder of this section, the PTAs' answers and comments to the questions are presented in order of which the questions appear in the survey, attached in Appendix A. A selection of the free-text answers is given in Section 5, discussion.

Table 3 lists the knowledge the respondents (for the organizations) have about reference material relating to transport appraisals and CBA. All but two respondents know about the organization Cooperation for improved public transport's publication "Samhällsnytta", while around half knows about the Transport Administrations material on effect calculations and ASEK-values.

	Yes	No	No answer	Total
The publication "Samhällsnytta"	22	1	1	<b>24</b>
Material on effect calculations	14	8	2	
Material by ASEK	12	10	2	

**Table 3 - Knowledge of reference material**

In question two, eleven categories of investments and operations are listed, and the answers reflect whether the respondent uses CBA when carrying out changes in any of these. The corresponding answers from the 2003-study were presented in Table 1. The overall pattern is that CBA is not used very much in the organizations, as most categories have mostly no-answers. Yes-answers are most frequently given by two to three organizations in each category, with extreme lows on the two first (operation and maintenance tasks, and labor changes) and high on one (major line or traffic changes). Overall, seven unique organizations have given the yes-answers, of which four have answered yes in more than one category. Out of the three "large-city"-PTAs, only Stockholm have given yes-answers.

Compared to yes-answers, more organizations have answered that they sometimes use CBA as a decision support. On average, four organizations answered they sometimes use CBA, and all but nine organizations have answered sometimes in at least one category.

	Yes	Some-times	No	Not resp.*	No answer	Total
Operation and maintenance tasks	0	5	11	8	0	<b>24</b>
Labor changes	0	1	16	7	0	
Investments in information systems	1	5	13	2	3	
Investments in payment system	3	1	16	1	3	
Investments in vehicles	3	4	9	7	1	
Changes in fare structure	2	7	14	0	1	
Minor line or traffic changes	2	5	16	1	0	
Major line or traffic changes	6	6	12	0	0	
Investments in bus stops	3	6	10	5	0	
Investments in stations	3	7	6	7	1	
Investments in rail and tram infrastr.	3	2	4	15	0	
<b>Average</b>	2	4	12	5	1	<b>24</b>

\* Not the responsibility of the PTA.

**Table 4 - 2016-survey results**

For at least five cases, organizations have answered that they are not responsible for the area of investment or operation. This is probably either because the operations are procured and is the responsibility of a private actor, or that some other institutional level holds the responsibility (either an instance in the county included in our sample, or the Transport Administration). Few organizations have chosen the alternative not to answer the question.

Turning to question three, 16 organizations answer that they are planning or discussing a large infrastructure project. The organizations with no-answers are typically of smaller type. Of the ones providing cost estimates of the investment (ten answers), the median investment is 200 million kronor, while the smallest and largest investment is estimated at one million and 6,000 million kronor respectively. While the smaller investments typically involve improvements in bus operations such as a new depot or new bus stops, the larger ones are either railroad or tramway investments, or investments in new trains. Six organizations answer they have planned to use CBA in these investments, most relating to the major rail or tramway. It is important also to note here that many rail and tramway investments are partially funded by the Swedish Transport Administration, which makes it mandatory to perform a CBA. We cannot distinguish whether the planned projects are such that the Transport Administration is an investment part. One organization has, however, answered they would use a simplified CBA when considering a new fare structure.

Like the previous, question four, which asks about the largest investment made in the last ten years, have many answers relating to railway investments. Of the 22 answers in total, seven are related to rail. However, seven organizations have also mentioned investments in ticketing systems as their largest investment. Of the ones answering they have made an investment, the median cost was 224 million kronor, while the largest investment was 5,000 million, and smallest 20 million kronor. The former was a tramway investment, while the latter saw an investment in a new ticketing system. In making the investment, four organizations answered they used CBA.

For the last question, the respondents were faced with a portal question to which they faced two different questions depending on their answers. The portal question had to alternatives: "CBA is never used, or used to a very small extent" and "CBA is often, or not seldom, used". 21 chose the first alternative, while three chose the second.

The respondents not using CBA were given four statements to which they would indicate to which degree they agreed with the statement. The answers are provided in Table 5. Most the respondents claim that the non-use of CBA is not due to lack of economic resources. Instead, they agree more with the three other statements. There seems to be a lack of knowledge in CBA, especially in the smaller organizations. There are, however, two smaller and one big organization answering they do not lack knowledge, so this is not the whole explanation. The answers also indicate the organizations regard CBA as a less important tool of decision support.

Three PTAs answered yes on the portal question, that CBA is often, or not seldom, used. All three use CBA in an initial planning stage, while one also uses it before a decision is to be made, and when the project is carried out. On average, two CBAs are carried out per year and PTA and are performed by the own staff in one instance, consultants in one, and a combination of the two in the third case. One of the three answer that they have existing guidelines for carrying out CBA, while one does not. The third respondent has answered that they do not want to answer the question. On the question whether the usage of CBA will increase in the future, none have answered that it will decrease. Two predict the usage will be unchanged, while one believes it will increase.

	Fully	Partly	Indiff- erent	Not very	No at all	Total
There is a lack of economic resources to carry out a CBA	0	2	4	7	8	<b>21</b>
Our organization lacks knowledge in carrying out a CBA	6	9	2	0	4	
Other factors than CBA are more important for our decisions	4	10	7	0	0	
Our current decision support is enough for our organization	2	12	5	1	1	

**Table 5 - Reasons for not using CBA for the 21 of total 24 PTAs that never use CBA or use it to a very small extent in the 2016 study**

#### 4.1 Comparison with the previous study

Comparing the respondents' knowledge about reference material relating to transport appraisal and CBA, a simple "by the eye" comparison shows a slight decrease since 2003 when it comes to the material on effect calculations.

Just looking at and comparing Table 1 and Table 4 gives a hint of what could be the case when it comes to changes in the use of CBA for different investments and other changes. It looks as it could have been an increase in the use of CBA for changes in fare structure since 2003. It also seems as it could have been a slight increase in the use of CBA for operation and maintenance tasks during the same period. The same could be said about minor line and traffic changes and maybe also for major line or traffic changes. However, the question is if the changes are statistically significant.

A statistical procedure in the form of chi-square tests for each question comparable over the years is therefore performed, as described in Section 3.2. Two versions of the tests are carried out: one where the yes and no answers for respective year is compared (Test 1), and another where yes *and* sometimes-answers are coded as yes, and compared with no answers (Test 2). The reasoning for the latter is that a sometimes-answers could be regarded as an indication that CBA is performed or discussed in some form.

	$\chi^2$ statistic	
	Test 1	Test 2
Operation and maintenance tasks	0,7627	1,6457
Labor changes	-	1,0900
Investments in information systems	0,3733	0,3003
Investments in vehicles	0,0219	0,1172
Changes in fare structure	0,6545	5,1318**
Minor line or traffic changes	0,4243	1,6301
Major line or traffic changes	1,1262	1,2753
Investments in stations	0,0604	0,1687
Investments in rail and tram infrastr.	0,2857	0,0040

*\*\* Significant at 5 percent level*

**Table 6 - Statistical results comparing CBA-usage 2003 vs. 2016**

In Table 6, statistically significant changes are indicated with stars. As is clear from the tests, all but one cases show no change between the survey years. This confirms that the PTAs seem not to use CBA to a larger extent in 2016, compared with 2003. The only exception is when bundling yes and sometimes-answers together for changes in fare

structure. There, significantly more PTAs are, or sometimes, uses CBA as decision support.

It should also be noticed that the yes column (in Table 1) in the 2003-study mainly was dominated by the three “large-city” PTAs (Stockholm, Gothenburg, and Malmö) while only Stockholm have given yes answers in the new study. When it comes to PTAs never using CBA or not considering it to be their area of responsibility, there are only small changes between the two studies.

Finally, comparing answers for why CBA is not used as a decision support (Table 2 and Table 5), the perhaps only difference is that year 2016 only two PTAs answer that lack of economic resources is the reason, compared to ten in the previous study. The responses have flipped side. For the other two questions possible to compare, there are mostly small differences. If anything, more PTAs regard themselves not to lack knowledge in the CBA-methodology compared to the 2003-study.

## 5 Discussion

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From the previous section, there seems not have been any substantial changes in the PTAs’ usage of CBA when they make changes in their operations. The only significant change in usage seems to be when changing fare structures, where two answered “yes” or “sometimes” in 2003, while the corresponding number in 2016 are nine. Why is this? During the 13 years between the studies, CBA methodology and valuations have arguably advanced, and CBA is an integrated part of, for example, the Swedish Transport Administration’s investments. Also, most of the respondents know about publications relating to CBA, and all but two have answered they know about the public transport sector-targeted publication “Samhällsnytta”. In the free-text answers available in the survey, some indications to why this is could be found, mostly when commenting on why the PTAs does not use CBA. Important to note for the free-text answers is that, although we have tried to be clear on this in the contact and survey, some responses might not necessarily reflect the opinion of the PTA, but rather the single respondent. We have tried to sort out only the reflections that mirror the PTAs’ view (personal views have been expressed, but are clearly marked as personal).

One respondent states that the CBA-framework is not very easy to apply for a public transport context and exemplifies with limited information on origin-destination-matrices, and that the method is hard to use to find new markets. The respondent does, however, write that they use CBA in larger fare and route changes, but that the framework is not very well suited for this. Why this is the case is not stated in the answer. While “pure” CBA seems not very used, elasticity calculations seem to be utilized by at least two of the respondents claiming they never, or very seldom, use CBA. Put in terms used by Nilsson et al. (2008), the latter would rather be a “simple tool” of analysis. Although elasticities in themselves do not explicitly give the social benefits, this is an indication that the PTAs are making analyses which could be implemented into more formal CBA methodology.

Similarly, the PTAs that answered they use CBA often, or not seldom, was given the opportunity to give free-text answers. One comment is that “*CBA is hard to understand for laymen, and does not always give the answers politicians want*”. The second comment given is that “*The amount of money is reduced, and every object needs a more thorough decision support*”. Although these two comments are somewhat in contrast to each other, combined they mirror an important aspect of making CBA analyses. Firstly, there seems to be some understanding of the need to economize with limited resources, and

that CBA can help in that. Second, the produced decision support might not be as informative as they would wish. Translating the net results from a more extensive analysis to a simpler sheet, or just a few single lines could perhaps help in this. But the more important note is how open politicians are for reports that are not in line with their viewpoint. Given that various forms of decision support are ordered by politicians, for example, a CBA, the expected response by the politician would be to read them pragmatically. If the politician deviates from the recommendations, the reason for the deviation should be possible to defend, and an argument made why resources are better spent another way. If politicians do not take in information from decision support not agreeing with their view, the ordered decision support does not act as such but are rather a grasp for arguments. A counter-argument would be, put very simply, that politicians are elected by the people, and are chosen with a mandate to implement what they think is the best solution.

In general, most responses place no valuation on whether CBA as a method is good or bad. Three respondents, however, are in their free-text answers positive to use CBA more in the future (two who are not currently using it to any larger extent) as a complement to existing decision support, but in some instance with the reservation that a more tailor-made framework should first be worked out (similar to the discussion above). One respondent has, however, expressed serious concerns for CBA as a method. The respondent writes that *"CBA relies on several postulates, which imply that the results are meaningless"*, that *"there is no social utility function that can be built from individual preferences"*, and that *"we do not consider CBA as a serious method"*. We are not familiar with whether the respondent is up to date with the research carried out the last decade, but several advancements have been made in developing the method. It is also not clear what decision support are used instead, that could weigh different scenarios against each other, and provide a similar decision support. The critique against CBA is, however, necessary to take seriously, and its shortcomings important to highlight, for example, what the analysis misses out on. Additional analyses are needed for these issues. Similarly, the advantages of CBA must be presented, for example, the possibility to compare scenarios systematically using the same standardized methodology, and giving robust rankings and concrete advises on what scenario gives the highest benefit for society.

A reflection from the answers is that it is not entirely clear if the respondents can distinguish between social benefits and revenues. For example, one respondent questions CBA because it *"seldom shows that, for example, fare reductions are socially beneficial"*, and that *"in many instances, we have increased ticketing revenue by lowering prices for some products"*. This illustrates an important difference between societal benefits and revenues. The fare decrease might well increase patronage, and/or increase revenue, but the effect on society need not necessarily be positive. A decreased fare implicitly implies more subsidies, for which a marginal cost of public funds is present, and might impose the need for more capacity in- and outside the vehicle. The two would be associated with additional costs in the CBA, and thus potentially a negative cost-benefit-ratio, just to illustrate with an example.

One could pose the question when, and by who, CBA should be used. Is it reasonable to expect that all PTAs should use CBA for all decisions? Probably not, the real-world usage should probably be more nuanced. One of the survey questions was whether CBA is used when planning *"minor line or traffic changes"*. What is a minor change can be discussed, but it is probably not an efficient use of money to carry out a full CBA in every of these cases. The effects are probably minor (and could perhaps be inferred by a simpler analysis) both regarding gains, but also costs. Requiring a CBA for each decision would probably also slow the work process. What is more important would

rather be to establish a mindset in the organization around the concept of societal benefits, think more of the overall impacts on society and the transport system, and weight benefits against costs. The hard thing is to not compare apples and oranges, but rather to have a fair and systematic way of comparing. Here, CBA is an existing and developed framework. Establishing the mindset, work out simple routines (for example Excel-sheets with simple inputs, giving CBA output), and include the cost and benefit reasoning in existing decision support would be a start. It could also give greater transparency in the decision process. Then, for larger investments or restructurings, a more thorough CBA should be carried out as one of more decision supports, just because the effects are often hard to separate and disentangle in qualitative analyses. It might, and might not, also reveal relationships that might not have been identified before. The important takeaway is that scenarios can be compared according to a systematic and on beforehand decided methodology, that the outcomes can be ranked, and that the decision support is transparent.

## 6 Conclusions

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This study has been concerned with the Public Transport Authorities' (PTA) use of Cost-Benefit Analysis (CBA). It has analyzed to which extent, and in which operations, PTAs are using CBA today, and investigated whether there have been any changes compared to the previous study. Apart from providing a snapshot of the current usage, the study is also designed to allow comparison with the studies by Ljungberg (2003;2007), which studied the same issue in 2003.

The results suggest that CBA is seldom used by PTAs in operations and investments, but that there are exemptions. CBA seems to be used to some greater extent for changes in fare structure, major line or traffic changes, and investments in bus stops and stations. The reasons for not using CBA seem not be that there is a lack of economic resources. Rather, the answering organizations claim that they lack knowledge. However, more importantly, other factors and decision supports are said to be more important for the organization.

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## Appendix A. Survey (in Swedish)

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### Samhällsekonomiska kalkyler och kollektivtrafik

I detta projekt, som finansieras av CTS (Centrum för Transportstudier), genomför vi nu en enkätundersökning angående användandet av samhällsekonomisk kalkylmetodik när det gäller investeringar i lokal och regional kollektivtrafik. Vårt övergripande syfte med projektet är att bidra till att skapa underlag för en så bra kollektivtrafik som möjligt. Syftet är även att jämföra praxis i användningen av **samhällsekonomiska analyser/kalkyler (CBA)**, samt jämföra svaren från denna enkät med en närmast identisk enkät som skickades ut till samtliga (motsvarande) regionala kollektivtrafikmyndigheter år 2003. Detta för att undersöka hurvida användningen har förändrats under de tolv åren. Liksom 2003 skickas denna enkät även nu ut till samtliga regionala kollektivtrafikmyndigheter i Sverige.

De svar som ges här kommer att ligga till grund för en rapport som skrivs av projektdeltagarna Andreas Vigren (VTI) och Anders Ljungberg (Trafikanalys). Denna rapport kommer samtliga svarande, och andra intresserade, att få ta del av när projektet är avslutat.

Svaren som ges ska representera den organisation (till exempel regional kollektivtrafikmyndighet eller trafikbolag) du svarar för.

**Organisationens namn:** \_\_\_\_\_

De första frågorna berör i vilken utsträckning din organisation känner till referensmaterial som kan användas som stöd i samhällsekonomiska analyser och beräkningar.

**Fråga 1a)** Känner er organisation till skriften ”Kollektivtrafikens samhällsnytta – En väg-ledning” som togs fram av Partnersamverkan för en förbättrad kollektivtrafik (tidigare fördubblad kollektivtrafik)?

Ja       Nej       Vill ej uppge

**Fråga 1b)** Känner er organisation till Trafikverkets material om effektsamband?

Ja       Nej       Vill ej uppge

**Fråga 1c)** Känner er organisation till samrådsgruppen ASEKs<sup>4</sup> rekommendationer för principer och kalkylvärden för samhällsekonomiska analyser/kalkyler?

Ja       Nej       Vill ej uppge

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<sup>4</sup> Arbetsgruppen för samhällsekonomiska kalkyl- analysmetoder inom transportsektorn

I en samhällsekonomisk kalkyl vägs nyttan av en investering eller annan åtgärd för olika grupper i samhället, såsom kollektivtrafikresenärer och bilister, mot framförallt investeringskostnaden, men även andra onyttor såsom exempelvis buller. Både nytto- och kostnadssidan beräknas i pengar efter en väl utvecklad metodik.

**Fråga 2)** Vid investeringsbeslut gällande lokal och regional kollektivtrafik, förekommer CBA (samhällsekonomisk analys/kalkyl som en del av beslutsunderlaget i er verksamhet när det gäller:

	Ja	Ibland	Nej	Ej vårt ansvars- område	Ej svar
Drift och underhållsåtgärder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personalförändringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Informationssysteminvesteringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Betalsysteminvesteringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fordonsinvesteringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Förändringar av taxestrukturen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mindre linje- eller trafikförändringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Större linje - eller trafikförändringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hållplatsinvesteringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stationsinvesteringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ban/Spårvägsinvesteringar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annat: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Fråga 3a)** Planeras eller diskuteras något större investeringsprojekt inom ert ansvars-område just nu?

Ja, till en beräknad kostnad om \_\_\_\_\_ kr.  Nej  
 Vill ej uppge

Beskriv gärna detta kort:

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**Fråga 3b)** Har er organisation planerat att använda CBA i detta fall?

Ja  Nej  Inte planerat projekt  Vill ej uppge

**Fråga 4a)** Vilken är den största investering ni genomfört under de senaste 10 åren?

Namn: \_\_\_\_\_ Kostnad \_\_\_\_\_ kr.

Vill ej uppge

Beskriv gärna detta kort:

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**Fråga 4b)** Användes CBA i detta fall?

Ja  Nej  Ingen investering har gjorts  Vill ej uppge

**Om er organisation inte, eller i mycket liten utsträckning, använder CBA, fortsätt till fråga 5. Annars, fortsätt till fråga 6.**

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**Fråga 5)** Om er organisation inte, eller i mycket liten utsträckning, använder CBA, vad beror detta på? (om din organisation upprättar CBA i mer än liten utsträckning, besvara fråga 6 istället). I vilken grad instämmer du med följande påståenden?

	Helt	Delvis.	Varken eller.	Nästan inte alls.	Inte alls
Det finns ej ekonomiska resurser att utföra CBA	<input type="checkbox"/>				
Det finns inte tillräckligt stor kunskap om CBA i vår organisation	<input type="checkbox"/>				
Andra faktorer än CBA har större betydelse för beslut som fattas	<input type="checkbox"/>				
Det beslutsunderlag som används är tillräckligt för vår organisation	<input type="checkbox"/>				

Kommentar eller eget förslag:

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Om er organisation inte, eller i mycket liten utsträckning, använder CBA är du nu klar med enkäten. **Stort tack för din medverkan!**

**Om samhällsekonomiska kalkyler inte sällan upprättas:**

**Fråga 6a)** När brukar de upprättas? (flera alternativ kan väljas om flera CBAs upprättas)

- I ett första planeringsstadium  Vill ej uppge   
Innan beslut ska fattas   
När åtgärden ska genomföras   
Efter åtgärden är genomförd

**Fråga 6b)** Ungefär hur många CBA upprättas per år?

\_\_\_\_\_ stycken per år  Vill ej uppge

**Fråga 6c)** Vem genomför kalkylerna? (flera alternativ kan väljas)

Egen personal  Konsulter  Annan: \_\_\_\_\_  
 Vill ej uppge

**Fråga 6d)** Har er organisation riktlinjer för hur en CBA ska genomföras?

Ja  Nej  Vill ej uppge

**Fråga 6e)** Hur bedömer er organisation att användningen av CBA kommer utvecklas i framtiden?

Öka  Minska  Vara oförändrad  Vill ej uppge

Utveckla gärna varför:

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Eventuella kommentarer:

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**Stort tack för din medverkan!**

## Appendix B. Survey (translated to English)

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### Cost-Benefit analysis and public transport

In this project, which is financed by CTS (Centre for Transport Studies), we are conducting a survey regarding the usage of cost-benefit analysis (CBA) for public transport investments. The overall aim of the project is to contribute to new knowledge that can enhance public transport. The aim is also to compare the practical use of CBA, and to compare the answers given to an almost identical survey that was sent out 2003 to the Swedish public transport authorities (PTA). This is to see whether the usage has changed during the twelve years. As in 2003, this survey is sent to all PTAs in Sweden.

The answers given in this survey will be part of a report that will be written by the project participants; Andreas Vigren (VTI), and Anders Ljungberg (Transport analysis). This report will be distributed to all respondents and other interested parties when the project is finished.

The answers given must represent the organization (for example, PTA) you represent.

**Name of your organization:** \_\_\_\_\_

The first questions are about to which extent your organization knows reference material that can be used as support when conducting CBAs and calculations.

**Question 1a)** Does your organization know the publication “Kollektivtrafikens samhällsnytta – En väg-ledning”, which was issued by Partner Cooperation (for enhanced public transport) (The Swedish Doubling Project)?

Yes       No       No answer

**Question 1b)** Does your organization know the Transport Administration’s material on cause and effect relationships (effektsamband)?

Yes       No       No answer

**Question 1c)** Does your organization know about the workgroup ASEKs<sup>5</sup> recommendations for principles and valuations for CBA?

Yes       No       No answer

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<sup>5</sup> Arbetsgruppen för samhällsekonomiska kalkyl- och analysmetoder inom transportsektorn

In a cost-benefit analysis, the benefits from an investment for different groups in society, such as public transport travelers or car users, is weigh against, most importantly, the investment cost, but also other externalities. Both the benefits and costs are calculated in monetary terms, using a well-established methodology.

**Question 2)** When making investment decisions on public transport, is CBA part of your decision support when investing in:

	Yes	Some-times	No	Not our responsibility	No answer
Operation and maintenance tasks	<input type="checkbox"/>				
Labor changes	<input type="checkbox"/>				
Investments in information systems	<input type="checkbox"/>				
Investments payment system	<input type="checkbox"/>				
Investments in vehicles	<input type="checkbox"/>				
Changes in fare structure	<input type="checkbox"/>				
Minor line or traffic changes	<input type="checkbox"/>				
Major line or traffic changes	<input type="checkbox"/>				
Investments in bus stops	<input type="checkbox"/>				
Investments in stations	<input type="checkbox"/>				
Investments in rail and tram infrastructure	<input type="checkbox"/>				
Other: _____	<input type="checkbox"/>				

**Question 3a)** Are you planning or discussing any larger investment in your area of responsibility right now?

Yes, and it amounts to (SEK): \_\_\_\_\_ kr.  No  
 No answer

Please describe the project briefly:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Question 3b)** Are your organization planning to use CBA for this investment?

Yes  No  No investment is planned  No answer

**Question 4a)**

Which is the largest investment your organization has carried out the last 10 years?  
 Name: \_\_\_\_\_ Cost \_\_\_\_\_ kr.

No answer

Please describe the project  
briefly:

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**Question 4b)** Did you use CBA in this instance

Yes     No     No investment has been undertaken     No answer

**If your organization do not, or to a very small extent, use CBA, continue to question 5. Otherwise, continue to question 6**

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**Question 5)** If your organization does no, or to a very small extent, use CBA, why is this? (if your organization carry out CBA, answer question 6 instead). To what extent does your organization agree with the following statements?

	Completely	Partly	Indifferent	Not very	Not at all
There is not enough economic resources to perform CBA	<input type="checkbox"/>				
There is not enough knowledge about CBA in our organization	<input type="checkbox"/>				
Other factors than CBA have more importance for the decisions made	<input type="checkbox"/>				
The decision support we use is enough for our organization	<input type="checkbox"/>				

Comments or own suggestion: \_\_\_\_\_  
\_\_\_\_\_

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If your organization do not, or to a very small extent, use CBA, you are now finished with the survey. **Thank you very much for your participation!**



**If CBA is not seldom conducted:**

**Question 6a)** When are CBAs usually conducted? (more than one alternative may be chosen)

- In the planning stage  No answer
- Before investment decision
- When the project is carried out
- After the project is carried out

**Question 6b)** About how many CBAs are carried out each year?

\_\_\_\_\_ CBAs  No answer

**Question 6c)** Who is making the CBAs?

Own staff  Consultants  Other: \_\_\_\_\_  No answer

**Question 6d)** Have your organization guidelines for how to carry out a CBA?

Yes  No  No answer

**Question 6e)** How do your organization think the usage of CBA will develop in the future?

Increase  Decrease  Unchanged  No answer

Please elaborate on why:

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Other comments:

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**Thank you very much for your participation!**

## Appendix C. Answering institutions

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<b><u>Public Transport Authority</u></b>	<b><u>Public Administration</u></b>
Blekinge	-
Dalarna	-
Gotland	-
Gävleborg	-
Halland	-
Jämtland Härjedalen	Länstrafiken i Jämtland
Jönköping	-
Kalmar	Kalmar Länstrafik
Kronoberg	-
Norrbottn	-
Skåne	Skånetrafiken
Stockholm	-
Södermanland	-
Uppsala	-
Värmland	-
Västerbotten	-
Västernorrland	-
Västmanland	-
Västra Götaland	-
Örebro	-
Östergötland	-

Centrum för transportstudier är ett forskningscentrum vid KTH – ett samarbete mellan KTH, VTI, WSP Analys & Strategi, Internationella Handelshögskolan i Jönköping, Trafikanalys, Trafikverket, Vectura och VINNOVA. Forskningsfältet omfattar bland annat samhällsekonomisk analys, hållbara transportsystem, prognosmodeller, trafiksimulering, transportsystemets finansiering och organisation, samspelet mellan transportsystem och regional ekonomi samt trafikanters beteenden och värderingar. Centret är en tioårig satsning med en total finansiering från parterna på uppåt 250 miljoner kr, oräknat tillkommande externa uppdrag. Verksamheten sysselsätter motsvarande minst 20 heltidstjänster, oräknat de många forskare vid de olika parterna som har sin finansiering på annat sätt, och har en gemensam lokalisering på KTH:s campus.

The Centre for Transport Studies is a new research centre at KTH – a cooperation between KTH, VTI, WSP Analysis & Strategy, Jönköping International Business School, Transport Analysis, Transport Administration, Vectura and VINNOVA. The research area includes cost-benefit analysis, sustainable transport systems, transport modelling, simulation, financing and organisation, interactions between the transport system and the regional economy, and travellers' behaviour and valuations. The Centre is a ten-year project comprising almost 250 million SEK, not counting additional research grants. The centre employs around 20 full-time equivalents, in addition to the researchers at the partners funded in other ways, and has a joint location at KTH campus.

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