

Value of Travel Time: To differentiate or not to differentiate

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Abstract

The Value of Travel Time (VTT) is one of the most crucial concepts in transport infrastructure appraisal, since travel time typically accounts for around 60-80 percent of the monetized benefits of new transport infrastructure when formal Cost–Benefit Analysis (CBA) is undertaken. The VTT can be differentiated on many dimensions examples being travel purpose and mode. This study scrutinizes the extent to which the VTT is (not) differentiated for empirical-theoretical, political-philosophical or practical reasons in the appraisal practices of the United Kingdom, Norway, Sweden, the Netherlands and Denmark by studying the country's appraisal Guidelines and interviewing 32 CBA-experts from the five countries. It was found that the five countries make different decisions with respect to differentiating the VTT on the dimensions mode, journey length and trip purpose. Moreover, it was found that the VTT is not discerned between regions in the five countries. Guidelines underpin this decision by arguing that politicians will reject CBA when the VTT varies between regions. The majority of experts consulted for this study endorse this choice. Since there is scant empirical evidence in the literature which underpins (or contests) that politicians will not accept this differentiation 19 Dutch politicians were asked to reflect on the desirability of a VTT differentiated between regions. It was found that preferences of politicians with respect to differentiating the VTT between regions are heterogeneous. Two politician oppose a differentiation arguing that every Dutch citizen has the same right to arrive early at home. However, the majority of politicians (13 out of 19) support a differentiation. Politicians, amongst others, state that the purity and impartiality of CBA should be safeguarded. One politician states that the added value of CBA evaporates when average value are used. This result questions the assumption articulated in Guidelines that politicians will reject CBA when the VTT is differentiated between regions.

1. Introduction

The Value of Travel Time (VTT) is one of the most crucial concepts in transport infrastructure appraisal, since travel time typically accounts for around 60-80 percent of the monetized benefits of new transport infrastructure when formal Cost–Benefit Analysis (CBA) is undertaken (Hensher, 2006; Mackie et al., 2001). Within the overall process of transport project appraisal values of travel time enter the picture in two ways (e.g. Daly et al., 2014; Kouwenhoven et al., 2014; Mackie et al., 2001). Firstly, values of travel time are used in generalized cost functions in forecast models. Secondly, a social value of travel time is used in a CBA for valuing travel time accruing from a transport project. This paper focuses on the social values used in a CBA.

The VTT can be differentiated on many dimensions examples being travel purpose and mode. Deciding on the dimensions on which the VTT should be differentiated is an empirical-theoretical, political-philosophical and practical matter (Mackie et al., 2001; 2003). Empirical-theoretical, since the extent to which the characteristics of individuals and trips influence trade-offs between costs and travel time can be derived from a mixture of empirical research and theoretical approaches (Mackie et al., 2003; Ojeda-Cabral, 2015). Political-philosophical, since one should ponder the extent to which the social value of travel time should be grounded in actual behavior. Amongst others, Sugden (1999) and

Harberger (1978, 1980) argue that the VTT should be as differentiated between individuals/trips as possible, since the VTT should be grounded entirely in actual behavior. These scholars claim that, a non-differentiation could lead to a misallocation of tax payers' money. Another argument conveyed by these scholars is that the non-segmentation of VTT is incompatible with the logic of CBA, since user paid transport improvements can be evaluated as socially unprofitable even if users are willing to pay for the improvements themselves. Mackie et al. (2001) take a different philosophical stance arguing that there is no reason for the value that the individual is willing to pay to reduce travel time to be equal to the value that society as a whole attaches to the reassignment of time of that individual to other activities. Following this line of thinking it is very well possible that the ethical observer decides that the VTT should not be differentiated for political or ethical reasons, despite empirical evidence (e.g. Flügel, 2014). Lastly, deciding on a differentiation of the VTT is a practical consideration, since Government must ensure that official procedures are practical and cost-effective for the use to which they will be put (Mackie et al., 2003).

The contribution of this paper to the literature is twofold. In a first study the extent to which the VTT is (not) differentiated for empirical-theoretical, political-philosophical or practical reasons is scrutinized for the appraisal practices of the United Kingdom, Norway, Sweden, the Netherlands and Denmark by studying the country's appraisal Guidelines and interviewing CBA-experts. Subsequently, in a second study 19 Dutch politicians are asked to reflect on the result of the first study that the decision against a differentiation of the VTT between regions is predominantly based on the perception – articulated by Guidelines and experts – that politicians will reject a CBA when the VTT is differentiated on this dimension. Section 2 discusses the methodology. Section 3 outlines the results of the first study and section 4 presents the results of the second study. Section 5 explores the implications of the results of the two studies and section 6 concludes.

2. Methodology

To keep the scope of this study manageable policies of five countries (the United Kingdom, Norway, Sweden, the Netherlands and Denmark) have been selected as countries for which the VTT policy will be analyzed in this study. These countries were selected since they are qualified by several scholars as countries with serious (and well-documented) CBA track records (e.g. Mackie and Worsley, 2013; Odgaard et al. 2005). The proper documentation enhances the feasibility of meeting this study's research goals. The implication of this demarcation is that the reader should bear in mind that the results of this study are not necessarily generalizable to all countries worldwide applying CBA for assessing transport projects. To limit the scope of the paper a second demarcation is made being that the study solely focuses on the differentiation of in-vehicle travel time (e.g. the value of waiting time is excluded in this study). To determine (the reasons for) the segmentation of the VTT Guidelines outlining the VTT policy (e.g. Fosgerau et al., 2007; Mackie et al. 2003) were examined. Since the reasons for (not) segmenting the VTT were not always made explicit in the Guidelines 32 CBA experts (policy makers and academics) who have experience with VTT and transport CBA were interviewed (seven from the United Kingdom, Norway and Denmark, six from Sweden and five from the Netherlands) to reveal the motivations. Moreover, the experts were asked how they evaluated the VTT differentiation in their country.

In the second study 19 (former) Dutch politicians (3 ministers or state secretaries and 16 Members of Parliament) were asked to reflect on the decision to not segment the VTT between regions. Since it turned out to be quite challenging to recruit Members of Parliament and (former) ministers the sample of politicians is rather small. Hence, the results of this second study should be

regarded as first insights into politicians' perceptions on VTT differentiation. The aim of this study was to sample at least two politicians from each political party which participated regularly in debates around infrastructure projects.

3. Study 1: differentiation of the VTT in the five countries

This section discusses how and for what reasons the VTT is differentiated in the five countries under scrutiny. To avoid repetition the United Kingdom being the country with the most detailed (English language) documentation with respect to this study's topic is the first country that will be discussed. The country descriptions start with an outline of the current practice followed by a discussion of the topics which are debated in the literature and by CBA experts.

3.1 United Kingdom

3.1.1 Practice

The British VTT is differentiated across business time and non-business time (which includes commuting).¹ For business time the VTT is discerned between modes. This follows from the marginal product of labor (MPL) theory and the associated empirical evidence which shows that business users of certain modes (especially air) tend to have relatively high MPL while business users of other modes have a relatively low MPL (Mackie et al., 2003). All countries under scrutiny in this paper make a distinction between business and non-business time for the same reasons as the United Kingdom. Hence, this distinction will not be repeated in the country reports of the other four countries in the next sections.

The VTT for non-business trips is not segmented, despite an acceptance that VTT varies with socio-economic characteristics (Mackie et al., 2003).² This non-segmentation has a long-standing tradition in the UK. At the end of the 1960s minister Barbara Castle decided that for all publicly funded projects, a single 'equity' value of non-business time would be used to value in-vehicle time savings for all locations, modes, incomes and non-business journey purposes (Nichols, 1975): *"The equity value of time is based on the average income of travelers on the journey to work and is updated using the growth in disposable income per head of population it is assumed to hold for all individuals on all forms of non-work journeys"*. A differentiation in VTT for non-business journeys between modes was not recommended, since the evidence that VTT differs between modes was not statistically robust (Mackie et al., 2003). However, it is argued that there is a strong case in principle for allowing values to vary by mode related to the innate characteristics of modes examples being comfort, cleanliness, security and information (Mackie et al., 2003).

3.1.2 Debate

A first point of criticism with respect to the current policy is that standard values for non-business journeys are used regardless of the size of the time saving. Amongst others, Welch and Williams (1997) argue that small time savings should be valued at a lower unit value, since recipients of small time savings do not notice the small time savings and/or cannot make full use of them. Mackie et al. (2001) argue that the arguments of Welch and Williams (1997) are bogus. Firstly, society justifies safety schemes on the basis of changes in small probabilities of accidents which may well go unnoticed

¹ The British VTT Guideline coins 'non-business trips' as 'non-working trips'.

² At the time of writing this paper the United Kingdom undertakes a new value of travel time savings study. However, the results of this study are not available yet.

by users. Secondly, small time savings can be unusable in the very short run, since not all activities can be moved in time and some activities take a minimum to complete, but over time people progressively reschedule their activities which makes the time savings useful. Moreover, Mackie et al. (2003) argue that the lower values for the small time savings arise because of the artificial nature of Stated Preference exercises, and the large imaginative leap the respondent is required to make to answer the question in a long-term rather than an immediate term manner. Since the size effects were regarded as counter-theoretical the VTT was based on the estimates of travel time changes over 11 minutes. Daly et al. (2014) outline that although a uniform value of time is used regardless of the size of time savings in the UK practice, it is prescribed to classify travel time benefits according to the size of the travel time saving. One respondent clearly supports this guideline, since the distinction of monetized benefits and non-monetized benefits is unrealistically sharp in his view. This respondent supports informing decision makers that 90% of the travel time savings are coming in units of less (or more) than five minutes if that is the case. Finally, Ojeda-Cabral (2015) reanalyzing the UK data concludes that, *ceteris paribus*, the extent to which the VTT is not lower for small travel time savings is unclear. His explanation is that size effects on the cost attribute – which were omitted in the original VTT study (Mackie et al., 2003) – were found to be highly significant.

A second point of criticism comes from Zhang and Laird (2014) who point out that the non-differentiation between journey lengths is not fair, since this leads to significant biases. Zhang and Laird found that particularly urban schemes improving the VTT on short journeys profit from the standard VTT, whereas the benefits of inter-urban schemes improving the VTT for longer journeys are underestimated. Various studies (e.g. Mackie et al., 2003; Abrantes and Wardman, 2011) echo the result that VTT for long distance trips are substantially higher than those for short distance trips. Mackie et al. (2003) discuss four possible explanations for this result. Firstly, the marginal disutility of travel time may increase with journey length as fatigue, boredom and discomfort set in. Secondly, travel time on longer journeys eats into the time available at the destination, so that the opportunity cost of time spent travelling can be expected to be greater on that account for longer journeys. Thirdly, the mix of journey purposes also varies with journey length; activities associated with longer journeys must be relatively highly valued to justify the travel time and cost involved in undertaking them. Fourthly, consumers are less perturbed by an increase of a given amount which is relative to a larger amount. Ojeda-Cabral (2015) coins this as ‘the relative effect’ which means that time and cost sensitivities should decrease as the current levels of time and cost increase. If the sensitivity towards time decreases less rapidly than the cost sensitivity (because time is fixed and cannot be transferred between periods) the VTT would increase with journey length. This explanation is behaviorally plausible (Tversky and Kahneman, 1991) but contradicts traditional economic theory which assumes that €1 = €1 regardless of how it is acquired or saved. Mackie et al. (2003) recommend not differentiating the VTT between journey distances, since they regard the fourth explanation to be plausible and do not feel comfortable about basing a recommendation on a phenomenon which is inconsistent with traditional economic theory. Again, the reanalysis of the British data by Ojeda-Cabral (2015) sheds new light on this issue. Ojeda-Cabral (2015) found that the ‘journey length effect’ was confounded with size effects. Therefore, it cannot be said that the VTT actually changes in one way or another as journey length increases.

Finally, the non-differentiation of the VTT between income groups is contested by British scholars. Pearce and Nash (1981) point out that projects which result in poor people saving time at an increased money cost of travel could be selected in circumstances in which they would rather forgo the time savings for the sake of cheaper travel. Mackie et al. (2003) observe that a positive relation

between VTT and income has been found in all major VTT studies. Hence, they recommend to undertake the entire evaluation of a transport project in income quintiles so that the pattern of benefits across income and social groupings would be displayed. A subsequent step would be to apply the social weightings recommended by the Greenbook (Treasury of the United Kingdom, 2003) to the time and money benefits so as to arrive at a social evaluation. However, Mackie et al. (2003) note that this approach is probably too challenging, since institutions around the world such as the World Bank have found distributive analysis an onerous and data hungry procedure. When a full social weighting scheme proves to be challenging they recommend on pragmatic ground to use a set of standard values of non-business trips for routine appraisal work. For major policy alternatives and quasi commercial projects Mackie et al. (2003) recommend the use of a VTT which differentiates between income groups combined with distributional weighting. Zhang and Laird (2014) claim that the increasing availability of large transport models, LUTI models and GIS datasets enhances the feasibility of using local VTT values. They show with case studies that travel time benefits calculated with local values can differ significantly from standard values and consequently advocate increasing use of disaggregated (or even local) values of time in combination with a distributional analysis. Despite the empirical evidence and practical feasibility, the British Guideline for transport project appraisal Webtag (Department for Transport, 2014) advises against the differentiation of the VTT between income groups on ethical grounds: *'if values of time for appraisal are based on individuals' willingness to pay (behavioral values) which are related to income, then investment decisions will be biased towards those measures which benefit travelers with high incomes. Investment would be concentrated into high-income areas or modes, and the interests of those on lower incomes, who may already suffer from relatively lower mobility and accessibility, will be given less weight. For this reason, the first source of variability is controlled for by the use of average values, which should normally be adopted in transport appraisal'*. A respondent nuances this Guideline arguing that in practice project sponsors are obliged to calculate the benefits of their scheme with the standard values but are at liberty to calculate benefits of a scheme using a VTT which matches the distance or income profile of the travelers affected in a sensitivity analysis.

Three respondents explicitly argued in their interview that equity considerations are the paramount reason for the non-differentiation of the VTT between regions. The first and second respondent state that the decision not to differentiate is based on the idea that people are equal. They argue that a differentiation of VTT will reveal that people in high income areas such as London are willing to pay more for travel time savings than in Leeds, amongst others, which skews investments to London. The second respondent regards a differentiation of VTT by income or region as a potential political minefield. According to this respondent a decision to differentiate will be interpreted as a very clear statement that Government regards the time of a senior executive riding on a high-speed rail as more valuable than the time of low-paid workers in the North-East of Britain. The respondent foresees that the politician who decides on such a differentiation will probably receive nasty questions like: 'is the time of an executive worth more to you than a minute of time of a worker?' The respondent explains that politicians prefer to evade these questions and will think twice before opening such a can of worms.

3.2 Norway

3.2.1 Practice

The Norwegian VTT for non-business trips is differentiated between modes and journey length (Ramjerdi et al., 2010; Eliasson et al. 2015). Travel time savings on trips longer than 70 kilometers are valued almost twice as high as trips shorter than 70 kilometers. Although Østli, et al. (2012) conclude that the VTT in Norwegian cities is higher than in rural areas the VTT is not differentiated between income groups or regions in the current practice. Flügel (2014) argues that a distinct geographical segmentation of VTT is likely to be difficult to implement and maintain politically in case of resistance by stakeholders from disadvantaged regions.

3.2.2 Debate

Among Norwegian experts there seems to be consensus that the VTT should not be differentiated between regions and income groups despite empirical evidence revealing that the differences exist. Six respondents explicitly stated that they consider the decision not to differentiate VTT between income groups or regions to be acceptable. Three respondents state that political acceptability is the key rationale for the non-differentiation:

- Respondent 1: *"In principle you should do it, but I think it is politically very difficult. If you differentiate between income groups you implicitly say that some human beings are not that interesting. The only thing poor people have enough of is time. There are political pitfalls. So better leave it alone;"*
- Respondent 2: *"What we are doing in practice is that we use one value for all income groups, we don't differentiate which means that we somehow make some equity judgment implicitly."*
- Respondent 3: *"In practice standard time values are used to a more equal treatment of rich and poor people. People get the same value for their time."*

Flügel (2014) introduces the 'mode-effect dependent equity value' – which comes down to a weighted average over all user groups of the VTT in a given transport mode – as a conceptually appealing improvement of the Norwegian practice, since the level of equity is fully retained and the degree to which the VTT aligns with actual VTT of travelers improves.

3.3 Sweden

3.3.1 Practice

In Sweden the non-business VTT is differentiated by mode and journey length and not differentiated by income groups or regions (Börjesson and Eliasson, 2014; Eliasson et al. 2015). The decision to vary the VTT by journey length and mode results from the Swedish Value of Time Study (Börjesson and Eliasson, 2014) which detects a VTT differentiation on these dimensions (even after controlling for social-economic differences such as income). One respondent explains that the main explanation for the differentiation in journey length is that in general the time spend on an activity (e.g. attending a meeting or visiting relatives) is more valuable to a person when the person travels a long distance compared to an activity for which one only travels for a few minutes. Other rationales for a higher VTT for longer journeys are matters of comfort and boredom.

3.3.2 Debate

Börjesson and Eliasson (2014) recommend to differentiate the VTT between Stockholm and the rest of the country, since they found in their study that the VTT for car trips is considerably higher in the county of Stockholm compared to the rest of the country even after controlling for differences

in income, employment status etc. The authors discuss several possible explanations for this result, but the most plausible explanation is that people living in larger cities have a higher 'Pace of Life' than people living in rural areas (e.g. Bornstein and Bornstein, 1976; Milgram, 1970). However, the Transport Administration eventually decided against a differentiation because of the impression that differences in VTT depend mostly on income differences. One respondent argued that this effect is not unique for Stockholm, referring to the finding of Abrantes and Wardman (2011) that travelers in London and the South East of England have valuations 27% higher than elsewhere in the UK. According to this respondent the 'Stockholm effect' exists without a doubt, however this is too politically sensitive to include in the Guidelines: *"people will not tolerate a higher VTT for Stockholm because they think the reason is that all the decision makers live in Stockholm. I don't think they will ever change it. It is very politically sensitive."* Two other respondents acknowledged that this effect might exist. They believe that the current practice with respect to this topic is not very comprehensive and it is definitely a field which is under researched.

Moreover, Börjesson and Eliasson (2014) outline that despite people in the experiments value small time savings less per minute than large time savings no differentiation is made between small and large time savings, since this distinction is not relevant for appraisal. The first reason is that a time gain is tied to a reference situation that eventually changes over time as trip contexts, individuals and the transport system change. Secondly, predicted benefits will be highly dependent on how investments are defined. For example, splitting a large investment into several small ones would seemingly yield less total benefits, although the final result is the same for the travelers. As a result Börjesson and Eliasson (2014) argue that there is no way to avoid deciding a 'delta t' value at which to evaluate the expression for the VTT which is always an arbitrary decision. They choose for a 'delta t' of 15 minutes for short trips (less than 100 kilometer) and a 'delta t' of 20 minutes for long trips (more than 100 kilometer) and recommend further research on this issue.

3.4 The Netherlands

3.4.1 Practice

In the Netherlands the VTT for non-business trips is differentiated across journey purpose (commuting and other) and modes (Kouwenhoven et al., 2014; Significance et al. 2013). Significance et al. (2013) explain that the key explanation for this differentiation is that the Dutch Ministry of Infrastructure and the Environment explicitly ordered VTTs discerned in these dimensions. The appendix of the Dutch Guidelines for valuing travel time savings (Warffemius et al., 2013) provides a differentiation of the VTT between income groups. One respondent explains that this differentiation is only used for assessing the distributional effects of road pricing policies and not used in CBAs for conventional transport projects. According to respondents the key reason for not differentiating the VTT between journey lengths and regions is that it is not expected that the VTT will differ significantly on these two dimensions because the Netherlands is a small and densely populated country. Another respondent states that a second reason for the non-differentiation of the VTT between regions might be that it is politically undesirable to differentiate between regions. Like it is politically difficult in international discussions on climate change to vary the Value of a Statistical Life between developed and undeveloped countries it would be difficult for Dutch politicians to accept a different VTT between the urbanized area (Randstad) and the rural areas. A third respondent observes path dependency with respect to the non-differentiation of the VTT: *'if the VTT is differentiated on dimensions A and B in the*

first VTT study undertaken in a country probability is high that VTT is differentiated on the same dimensions in the second and the third study’.

3.4.2 Debate

In the Netherlands there is no heated debate around the differentiation of the VTT among policy makers and academics. One respondent argued for a differentiation of the VTT between regions, since he believes that this differentiation exists as a result of self-selection. The respondent thinks that people with a high VTT are more likely to stay or move to the cities because a variety of amenities is accessible within short travel times. On the contrary, people with a low VTT are more likely to stay or move to rural areas. These people have to travel longer to amenities but apparently do not experience high disutility from longer travel times, otherwise they would have moved to the cities. Another respondent agrees that this differentiation might exist. However, this respondent emphasizes that the added value of this differentiation is questionable especially when one compares this with the added value of the improvement of other aspects of transport appraisal. According to this respondent an appraisal of a transport project is as strong as its weakest link. He thinks it is more efficient to improve the quality of transport appraisals through improving other aspects than via a differentiation of the VTT between regions.

3.5 Denmark

3.5.1 Practice

The Danish VTT study (Fosgerau et al., 2007) outlines that the VTT is not differentiated between income groups, modes, regions, size, journey length or journey purposes (Fosgerau et al., 2007). Hjorth and Fosgerau (2012) and de Borger and Fosgerau (2008) underpin the decision not to differentiate the VTT for large and small time savings with the same arguments as Börjesson and Eliasson (2014). Fosgerau et al. (2007) recommended to the steering group of the Danish VTT study that a level for the time difference of between 10 and 20 minutes should be used to compute the mean VTT for CBA. The steering group has then chosen a time difference of 10 minutes on the grounds that this is the conservative choice.

The reason for not segmenting between journey purposes for non-business trips was that in the econometric model, the travel purpose turned out not to contribute significantly to explaining the VTT. Fosgerau et al. (2007) argue that self-selection into modes is the most likely explanation for the observed differences in the VTT between modes. People who have a high VTT use the fast and expensive modes, while those who have a low VTT use the slow and less expensive modes. However, the Danish VTT study (Fosgerau et al., 2007) outlines that the steering group has taken the view that this property is likely to cause policy makers to reject the results. Hence, the steering group argued that CBA will be considered most relevant by policy makers if the analysis treats everybody equally. It has therefore been decided to use a standard value for all modes and incomes. Finally, it was an explicit wish of the steering group not to make a distinction between long and short trips, since the segmentation by trip length is hard to handle in practical applications (Fosgerau et al., 2007).

3.5.2 Debate

The decision not to differentiate the VTT between regions was not discussed explicitly in (Fosgerau et al., 2007). However, respondents agree that the VTT is not differentiated on this dimension for political-philosophical reasons. Respondents disagree on the topic of differentiating the

VTT between income groups and regions. Two respondents believe that a standard VTT results in a misallocation of investments. One of the respondents states that Jutland (sparsely populated region in the North of Denmark) is over financed as a result of the standard VTT. On the other hand, three respondents support the decision of not differentiating the VTT. One respondent makes the following statement: *“When a Value of Time which differentiates between income groups is used the CBA would be harder for politicians to accept. If they don’t like the project they will disregard the CBA using the argument that it is unfair that income is much higher in the capital city. I oppose to differentiate the values, because it will undermine the CBA.”*

3.6 Comparison of the five practices

Table 1 shows how the VTT is differentiated in the five countries. Between brackets the motivations for the decision (not) to differentiate are denoted. Four motivations are distinguished being political-philosophical (PP), empirical (E), theoretical (T) and practical (PR). Motivations which are made explicit in Guidelines (or related documents) are highlighted (bold and italics) to distinguish them from motivations which are derived from interviews with CBA experts and the academic literature.

Table 1: Differentiation of the non-business VTT in the five countries

	Mode	Distance	Trip purpose	Region	Income	Size
United Kingdom	No (<i>PP, E</i>)	No (<i>PP, E, T</i>)	No (<i>PP</i>)	No (<i>PP</i>)	No (<i>PP</i>)	No (<i>E, T</i>)
Norway	Yes (<i>E</i>)	Yes (<i>E</i>)	No (E)	No (PP)	No (PP)	No (T)
Sweden	Yes (<i>E</i>)	Yes (<i>E</i>)	No (E)	No (<i>PP</i>)	No (<i>PP</i>)	No (<i>T</i>)
Netherlands	Yes (<i>E</i>)	No (PR)	Yes (<i>E</i>)	No (PR, PP)	Only for road Pricing (PR)	No (T)
Denmark	No (<i>PP</i>)	No (<i>PR</i>)	No (<i>E</i>)	No (PP)	No (<i>PP</i>)	No (<i>T</i>)

Table 1 shows that the five countries make different decisions with respect to differentiating the VTT on the dimensions mode, distance and trip purpose. Moreover, Table 1 shows that the VTT is not discerned between regions and income groups based on political-philosophical grounds in the United Kingdom, Sweden, Norway and Denmark. In the Netherlands the VTT is not discerned between regions for practical and political-philosophical reasons.

4. Study 2: politicians on the (non) differentiation of VTT between regions

The observation in section 3.6 that the VTT was not differentiated between regions in the five practices under scrutiny is remarkable, because empirical evidence reveals that the VTT in cities such as Stockholm and London is significantly higher than in the periphery even after controlling for socioeconomic differences (e.g. income), trip lengths etc. (e.g. Börjesson and Eliasson, 2014; Abrantes and Wardman, 2011). Moreover, CBA experts spontaneously argued that they expect the VTT to be higher in other (capital) cities than in the periphery. The higher VTT in (capital) cities is also supported by empirical studies which conclude that people living in cities have a higher ‘Pace of Life’ than people living in rural areas (e.g. Bornstein and Bornstein, 1976; Levine, 2006; Milgram, 1970). Several CBA experts interviewed for this study believe that the non-differentiation is undesirable, since it leads to wasting money on projects in regions where the actual VTT was much lower than the average VTT used in current CBAs (e.g. Jutland and the periphery of Norway and Sweden). However, the majority of CBA experts consulted in this study and several CBA Guidelines consider a non-differentiation of the VTT between regions desirable underpinning their preference with the argument that politicians will not

accept (or even undermine) CBA when the VTT varies between regions. Despite this conviction of CBA experts there is no empirical evidence available in the literature which underpins (or contests) that politicians will not accept a differentiation of the VTT between regions apart from the prescription of minister Barbara Castle end 1960s that the VTT should not differ between individuals on all forms of non-work journeys. Hence, it was decided to analyze the preferences of Dutch politicians towards differentiation of the VTT between the Randstad (four major cities and their agglomerations) and 'the Region' (North, East and South of the Netherlands).

Figure 1: Four agglomerations which are coined as 'the Randstad'.



19 national politicians (ministers, undersecretaries and Members of Parliament) were asked to answer the following question:

'Suppose that a result from the new Dutch VTT study is that people living in the Randstad have a VTT of 12 euro and people living in the region have a VTT of 8 euro. Should we then differentiate the VTT between the Randstad and the Region, use an average value or estimate the benefits of a transport project both with the disaggregate values (8 euro and 12 euro) and an average value'.

The responses of the politicians are presented in table 2. A distinction is made between 'regional politicians' (RP) and 'non-regional politicians' (NRP).³ Politicians are labelled as 'regional politicians' when they explicitly stated in their interviews that they were attached to a Region in the Netherlands other than the Randstad and aim(ed) to allocate more money for infrastructure to this Region.⁴ One MP illustrated being a 'regional politician' as follows: *'as an MP you belong to a political*

³ Note that candidates to the elections of the House of Representatives are chosen from party lists according to a system of proportional representation which differs from the British and American model in which one Representative is elected for each constituency. The key motivation for Dutch politicians to represent a specific region is generating votes for their party which might be rewarded with a favourable position at the party list for the next elections.

⁴ It is very well possible that 'non-regional politicians' aim to skew investments to a specific group (e.g. public transport, the Randstad, students). They are labeled as 'non-regional politicians' since they do not argue for skewing more investments to the 'Regions'.

party but you also represent your region. If you want to be re-elected voters have to see that you represent them well in the National Parliament. That's why I argued for projects in my region.'

Table 2: Politicians' perceptions on the (non) differentiation of the VTT between 'the Randstad' and the 'Region'

Respondent	Regional or non-regional politician	Party	Response
1	RP	Liberal	If the differentiation is based on proper research you should use this differentiation in a CBA. In the Randstad we have more transport problems than outside the Randstad, so I think that the results make sense.
2	RP	Christian-democrat	I support the differentiation, since it makes sense that values are higher in the Randstad. As a result of the congestion in the Randstad family life is under pressure. Fathers arriving late at diner or at the child care. Horrible. I can imagine that these people are willing to pay a large sum of money to arrive on time at home. However, I also think this can be taken as evidence that the Randstad is 'too expensive' and we should invest more in the Regions.
3	RP	Christian-democrat	I think that CBAs should be as pure and impartial as possible. Hence, I am in favor of the differentiation. However, as a regional politician I can still argue for regional projects despite poor CBA scores.
4	RP	Christian-democrat	Honestly, I don't know what to choose. However, in my role as a regional politician I will probably contest this result and argue that the value should be 12 euro in the Region and 8 euro in the terrible Randstad.
5	RP	Christian-democrat	I would favor a differentiation, since I can imagine that people living in the Randstad have a higher VTT. If you have to face congestion every day than you are relieved when an infrastructure project leads to five minutes of travel time savings. Many people living in the Region are used to make long trips. For them it doesn't matter that much whether a trip is ten minutes longer or shorter.
6	RP	Labor	As a regional politician I would favor the decision to use average values and argue against a discrimination between regions. Everyone has the same right to arrive early at home after a day of work.
7	RP	Labor	I always thought it was nonsense to talk about a few minutes of travel time savings accruing from a project, since infrastructure projects are generally approved for other reasons than saving a few minutes of travel time. However, of course all information is welcome and then I would say that you should differentiate the VTT between the Randstad and the Region, because I can imagine that the VTT is higher in the Randstad.
8	RP	Christian-Union	I would not differentiate the VTT between the Randstad and the Region. I don't see any good argument why it would be better that someone in the Randstad saves time than when someone in the North of the Netherlands saves time. I think that citizens from the Randstad and the Region should be treated equally in a CBA.
9	NRP	Right-wing populist	I would support a differentiation. In the end politicians should aim for maximizing the welfare of the country and it is clear that the cities contribute more to welfare than the regions. Of course you have to do something for the regions, but the focus should be on the stronger economic areas.
10	NRP	Liberal	I would favor a differentiation. It is just a fact that transport problems in cities differ from transport problems in rural areas, so you should acknowledge this difference. We can spend the tax payers' money only once and in times of scarcity I would prefer an allocation of money to the biggest problems which are probably located in cities.
11	NRP	Liberal	I don't have a strong opinion. I tend to say that you should make this difference since I can imagine that there is some self-selection. People decide to settle in the Region because they prefer living in a beautiful area of the country over short travel times. If you don't like to travel you settle in the Randstad. Although I tend to favor a distinction I can comprehend that other politicians will argue for an average value, since this will treat all Dutch people equally.
12	NRP	Liberal	I think you have to make the distinction between the Randstad and the Region. The usefulness of CBA is that it reveals that investments in the urban areas are more profitable than investments in the rural areas. If you decide to calculate the costs and benefits with average values the added value of CBA evaporates.
13	NRP	Social-Democrat	You should differentiate because a project in the Randstad has a different effect than a project in the Region.
14	NRP	Social-Democrat	You should differentiate. If the VTT in the Randstad is higher than you should not pretend that there is a standard value for the Netherlands.
15	NRP	Social-Democrat	You should make this distinction, since the pace of life is different in the city than in the rural areas. In general, people living in the Randstad have higher expectations with respect to living standards. They assign high value to the accessibility of amenities. They don't mind paying higher rents in reward to living in a city which fulfils their needs.
16	NRP	Christian Union	The extent to which I think the distinction is warranted depends on the cause for this difference in valuation. I can imagine that people assign a higher value to five minutes of travel time savings when their travel time is ten minutes than when their travel time is two hours. I think it is not fair to make this distinction if the difference is caused by the fact that the relative travel time savings are lower for people in the Region, since they make longer trips.
17	NRP	Labor	This is not a choice that should be made by politicians. Academics should make this choice and if they find that VTT in the Randstad is higher than in the region it is legitimate that they make this differentiation. If the VTT is higher in the Randstad this would not surprise me at all.

18	NRP	Green	I don't think my opinion is of any value. I have to admit that I am not really interested in the monetized travel time savings. What I need to know for evaluating a project's desirability are the number of people who experience travel time savings each day and how many travel time savings these people save on average. This is a level of aggregation in which I can think.
19	NRP	Socialist	If objective research establishes that the VTT is different than you should make this distinction. It is clear that there are differences between the Randstad and the Region. Incomes are different, real estate prices and rents are different. So it is no wonder that the VTT differs as well.

A key observation that can be derived from table 2 is that 13 out of 19 politicians clearly support a differentiation of the VTT between regions. Several of these politicians stated that they want CBA to be based on empirical evidence as much as possible to enhance the purity and impartiality of the instrument. One politician states that the added value of CBA evaporates when average value are used. Contrastingly, Politicians 6 and 8 clearly argue against a differentiation. These politicians reveal an egalitarian worldview arguing that everyone has the same right to arrive early at home. Politician 16 considers a differentiation not warranted when the difference in value is caused by the fact that people in the Regions make longer trips and therefore experience a relatively small travel time compared to the total duration of their trip. Three politicians did not have a clear opinion (politicians 4, 11 and 18). Politician 11 tends to support a differentiation, but understands that other politicians support average values. Politician 4 states that he would contest a differentiation after the interviewer told him that the differentiation would result in lower CBA scores for the projects in his region. The statement of politician 18 echoes the routine in the United Kingdom to present disaggregate information with respect to travel time savings. In all, it can be concluded that preferences of politicians with respect to differentiating the VTT between regions are heterogeneous. However, the fact that the majority of politicians supports a differentiation questions the assumption articulated in Guidelines that politicians will reject CBA when the VTT is differentiated between regions.

5. Implications and discussion

This section discusses the results of this study. Section 5.1 specifically discusses the implications of the results of section 4 for applied CBA and section 5.2 handles other discussion points and lists avenues for further research.

5.1 Implications of politicians' perceptions

The result that the majority of the politicians support discerning the VTT across regions whereas experts decided against this differentiation because they believe that politicians will otherwise reject CBA is surprising and raises the question whether experts made a poor judgment or that the stated preferences of politicians not align with their preferences in reality (i.e. the politicians gave socially desirable answers in the interviews). On the one hand, the fact that the majority of the politicians opt for a differentiation supports the first interpretation. On the other hand, arguments can be found in this study for supporting the judgment of the experts. Politicians 4, 6 and 8 announce that they will challenge a differentiation of VTT between regions. Moreover, one British respondent interviewed for this study argued that it takes a lot of courage for a politician(s) to argue for a differentiation of the VTT between regions when rivalry politicians emphasize that this implies that the time of an executive living in the capital is valued more than the time of a worker in the periphery. The respondent coins this as a 'political minefield' and a 'can of worms'. It is not unimaginable that politicians preferring a differentiation of VTT between regions in the end will agree with a non-differentiation to avoid this contentious political issue. Since it is not clear which interpretation is more plausible, further research is needed. It is especially interesting to scrutinize the extent to which the

stated preferences of politicians are generalizable to other practices. Perhaps, an explanation for the statements of the politicians opting for a differentiation of the VTT between regions is that the Netherlands suffered from a financial-economic crisis and budget cuts at the time the politicians were interviewed which may enhance the importance of the 'efficiency' of government projects compared to the 'distribution of welfare'. Illustrative is the quote of Politician 10: *"we can spend the tax payers money only once and in times of scarcity you would rather spend on the biggest problems which are probably located in cities."* It is interesting to scrutinize whether politicians from countries with a well running economy (like Norway) have different preferences than the Dutch politicians.

What are the implications of the two plausible interpretations of this study's results? When it is established that experts misjudged political preferences with respect to differentiating the VTT the implication of this study should be differentiating the VTT between regions when this distinction is established empirically. The only valid argument against this differentiation mentioned by a Dutch respondent is that the added value of the differentiation should be scrutinized. When the added value of the differentiation for the quality of transport appraisal is low (compared to alternative improvements) the modification should be re-evaluated.

However, When the statements of politicians turn out to be hypothetical implying that politicians will be hesitant to defend a differentiation of VTT between regions in reality, the results of this study will still have implications which will be discussed below. The first implication is that the practices violate the premise that social appraisal of government projects involves both descriptive and normative economics and that the descriptive assessment of a government project should be separated from the normative assessment of the project (e.g. Arrow et al., 1995; Galvez and Jara Diaz, 1998; Goulder and Williams, 2012; Kaplow et al., 2010, Nyborg, 2014). Although theory prescribes that a social appraisal should start with a descriptive assessment of the aggregate net willingness to pay of the project's effects which can be used as input for normative (and heterogeneous) social welfare functions of decision makers, normative considerations are interwoven in the descriptive analysis in the five practices under scrutiny (e.g. the VTT should not be differentiated between regions) and the output of this analysis is not portrayed as an input in heterogeneous social welfare functions, but as a descriptive assessment of the social costs and benefits of infrastructure projects (e.g. Swedish Transport Administration, 2012; Romijn and Renes, 2013, Treasury of the United Kingdom, 2003). The issue here is that concealing the normative considerations in the descriptive analysis prevents decision makers from making an own assessment and ask for a recalculation of CBA when the normative considerations do not coincide with their own belief system.

The analysis of the Guidelines and interviews with CBA experts reveal that preventing a rejection of CBA by politicians is the key motivation for violating this premise of social appraisal. Some concessions to micro-economic theory are accepted to foster the political acceptability of CBA over a state of affairs with no CBA at all. This genuflection for (perceived) political pressure is a dangerous slippery slope, since it is not clear where the tipping point lies which makes developers of CBA Guidelines (and other actors who are convinced of the goodness that comes along with CBA) taking the stand that it is better to have no CBA at all compared to a CBA that is peppered by assumptions which satisfies politicians. To give an example, what would (and should) be the response of CBA proponents when a politician orders that CBA analysts no longer include the benefits for a specific region of a country in the appraisal of government projects? Would they reject CBA, support CBA or only support CBA under the condition that this concession is explicitly communicated in the conclusions of a CBA report? And, to give an even more extreme example, what would be the response

of CBA proponents when politicians demand CBA analysts to establish that all projects included in the coalition agreement have a positive aggregate net willingness to pay?

Besides the dangerous slippery slope the decision to not differentiate the VTT for political reasons complicates the interpretation of the results of a CBA study. Although CBA is predominantly derived from micro-economic theory and a utilitarian social welfare function the decision in Guidelines against the differentiation of the VTT between regions assumes that politicians have an egalitarian social welfare function with respect to this topic assigning equal weight to travel time benefits of people living in the periphery and people living in the cities all else being equal. This mixture of egalitarian and utilitarian elements makes it difficult to pinpoint what conclusions can be drawn from a CBA.

Moreover, the decision against differentiation of the VTT for political reasons distorts methodological discussions with respect to CBA. An illustrative example is that in Sweden and Denmark the key argument for not differentiating the VTT for small and large time savings is that this would contradict micro-economic theory. Contrastingly, the VTT is not differentiated between regions or income groups for political reasons although the differentiation can be legitimated on micro-economic theory and empirical evidence. Hence, in some cases 'the methodological choice should be in line with micro-economic theory' is used as a decisive argument, whereas in other cases deviating from micro-economic theory is not considered to be a problem at all. Hence, CBA suffers from internal inconsistency.

One way to reclaim consistency is separating the normative assessment from the descriptive assessment in social appraisal of transport projects implying that the VTT should be differentiated in the descriptive assessment, when empirical arguments point in this direction which are supported by micro-economic theory. To be clear, politicians have the right to deviate from this descriptive assessment in their own normative assessment. To illustrate, suppose that the descriptive assessment concludes that the aggregate net willingness to pay for travel time savings accruing from Project A and Project B are 200 million euro and 300 million euro respectively. In this case politicians can still draw the conclusion – from their own normative perspective – that the travel time savings of Project A are worth more to society than the travel time savings of Project B. For instance, Politician 3 explicitly states that he thinks that the CBA (descriptive assessment) should be as pure and impartial as possible, but that he can still argue for the desirability of projects with poor CBA scores (which coincide with his normative perspective).

A second way to regain consistency is grounding the social appraisal entirely in egalitarian assumptions. In this case the value of all peoples' travel time savings should not be differentiated at all. However, when this line of thought is extrapolated to other methodological areas of the CBA the results will be non-trivial. For instance, the value of travel time savings for business and non-business trips should be equalized and abandoning discounting should be considered, since it can be argued that merits for people living in the future are unequally treated by discounting (e.g. Chichilnisky, 1997).

From the two solutions aiming to regain consistency in the theoretical framework of CBA the first one is attractive from a democratic perspective. The essence of this solution is that no longer non-politicians (e.g. civil servants participating in a steering group or developers of CBA Guidelines) make equity judgments with respect to differentiating the VTT, but that politicians are charged with these equity judgments. This solution entails that travel time benefits of a transport project are determined in the descriptive assessment. Subsequently, politicians are allowed to assess the worth of the travel time benefits to society based on their (heterogeneous) social welfare functions. Kaplow et al. (2010) argue that decision makers could be assisted with this assessment by sensitivity analyses on the

normative judgments. More specifically, whereas a politician with an utilitarian belief system can use the descriptive assessment of travel time savings in his normative assessment of the travel time savings which accrue from a transport project, a politician with an entirely egalitarian belief system can be served a sensitivity analysis in which the travel time benefits of a transport project are assessed with a 'single equity VTT'. Kaplow et al. (2010) observe that what can be called 'moral sensitivity analyses' are rarely used in practice. This is peculiar, since moral sensitivity analyses will enable representatives with diverging ethical views with respect to the differentiation of the VTT to make a well-founded judgment about the desirability of a policy option based on the same descriptive assessment.

Although 'moral sensitivity analyses' would equip politicians with different belief systems with assessing the social desirability of (travel time savings accruing from) a transport project one politician (Politician 18) argued that he needed disaggregated information (how many people save how much time as a result of the transport project on an average day) to assess the desirability of a transport project. Hence, it can be concluded that politicians need three types of information to assess the social desirability of transport project being 1) a descriptive assessment of the travel time savings accruing from a project in which in VTT is differentiated when empirical arguments point in this direction; 2) moral sensitivities for politicians with non-utilitarian belief systems; 3) disaggregated information.

5.2 General discussion and further research

Besides the implications of the politicians' perceptions this study raises other topics for discussion the most important one being the finding of Ojeda-Cabral (2015) that adding size effects on the cost attribute in the analysis of the VTT results in the disappearance of the distance effect. If this finding is generalizable – to sort this out is an interesting topic for further research – the consequence should be a reconsideration of the 'distance effect' in the Swedish and Norwegian practice.

A second topic for discussion is that although there are many rigorous studies undertaken which aim to derive a (differentiated) VTT (see Abrantes and Wardman, 2011 for a meta-analysis), limited empirical research is done on the interpretation of results of VTT studies. For instance, several interpretation are given for the finding that the VTT increases with journey length (e.g. boredom, budget effects, relative effect and 'people with higher incomes make longer trips'). However, only little empirical studies are undertaken to explain which of the interpretations is most auspicious.

Moreover, the number of studies which focus on a differentiation of the VTT between regions is scarce (notable exceptions are Borjesson and Eliasson, 2014 and Abrantes and Wardman, 2011). When the stated preferences of Dutch politicians turn out to be generalizable to other countries – which is also an interesting topic for further research – this scarce knowledge base is undesirable.

Finally, further research is required on the practical usefulness of different variants of 'moral sensitivity analyses' in a political decision-making process. To illustrate, analysts can provide politicians with CBA scores when the VTT is differentiated between regions and when the VTT is not differentiated between regions and leave the decision which normative judgment coincides best with their belief system to the politicians. However, analysts can also take a representative sample of the population and the respondents whether they prefer a differentiation and also ask on which political party they voted in the last elections. This information can help politicians to assess which normative premises aligns best with their belief system. It is interesting to scrutinize in further research whether one of the two variants of 'moral sensitivity analyses' is more meaningful and useful for politicians.

6. Conclusion

This study concludes that the Netherlands, the United Kingdom, Norway, Sweden and Denmark make different decisions with respect to differentiating the VTT on the dimensions mode, journey length and trip purpose. Moreover, it was found that the VTT is not discerned between regions and income groups and that this decision is predominantly based on the perception of CBA experts that politicians will not accept this variation. This result is peculiar, since there are studies supporting the differentiation between income groups and regions empirically, whilst the differentiation of the VTT between journey length was recently challenged for the British practice by Ojeda-Cabral (2015). Since there is scant empirical evidence in the literature which underpins (or contests) that politicians will not accept CBA when the VTT is segmented between regions 19 Dutch politicians were asked to reflect on the desirability of a VTT which is differentiated on this dimension. It was found that preferences of politicians with respect to differentiating the VTT between regions are heterogeneous. Two politicians oppose a differentiation arguing that every Dutch citizen has the same right to arrive early at home. However, the majority of politicians (13 out of 19) support a differentiation. Politicians, amongst others, state that the purity and impartiality of CBA should be safeguarded. One politician states that the added value of CBA evaporates when average value are used. This result questions the assumption articulated in Guidelines that politicians will reject CBA when the VTT is differentiated between regions. The implication of the observation that politicians' preferences with respect to differentiating the VTT in general and between regions in particular are heterogeneous is that politicians need different information to make a desirability judgment. Politicians need to be provided with three types of information to safeguard that all politicians are empowered to assess the social desirability of transport project being 1) a descriptive assessment of the travel time savings accruing from a project in which in VTT is differentiated when empirical arguments point in this direction; 2) moral sensitivities for politicians with non-utilitarian belief systems; 3) disaggregated information on how many people save how much time as a result of the transport project on an average day.

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