Institute of Transport Economics
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Summary

Valuation of driving comfort for different road types

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The purpose of this project is to provide recommendations regarding how to include the value of driving comfort related to road type in economic appraisal of road projects. This is done by using different values of travel time for different road types, where road types with a high level of driving comfort have a lower value of travel time. Our recommendations are based on international literature combined with an analysis of data from the toll road project E18 Arendal–Tvedestrand. Compared to the average value of travel time, we recommend using a 20 percent lower value of travel time on for four-lane highways, and a 15 percent higher travel time on two-lane highways without yellow lane marking. We emphasise that the estimates are uncertain and recommend more research, including collecting and analysing data on the route choice of car travellers.

Objective and theoretical foundation

In the present report, we have studied the valuation of driving comfort for different road types. The objective of the project has been to recommend concrete values to include this value in economic appraisals of road projects. This is achieved by using different values of travel time (VTT) for different road types, where road types with higher driving comfort have lower VTT. The VTT can be expressed by VTT multipliers that express the VTT of a road type relative to the road type with the highest comfort, or relative to the average. We do not consider the potential effect of road quality on driving costs.

The calculations and recommendations of VTT multipliers has been done based on theoretical discussions related to the subject, a literature review and an empirical case study. Our theoretical definition of driving comfort is a joint term that captures increased productivity (more useful use of travel time), increased enjoyment of driving and reduced subjective perception of insecurity while driving.

Insecurity is strongly linked to traffic safety, and multiple measures aimed towards reducing the likelihood of accidents will also have an effect on perceived insecurity, and hence driving comfort. At the same time, the risk of accidents is usually included in cost benefit analyses as a separate entry, meaning that if this is not accounted for, one have a risk of double counting. When we in the present project quantify the comfort effect, we are therefore interested in including the effect of perceived insecurity, but not the effect of objective risk of accidents.

Other topics that may overlap are congestion, speed limit and road standard. Congestion mainly affect travel time, but also comfort. The new Norwegian valuation study includes recommendations of factors to take account for the comfort effect of congestion, and we therefore want to exclude this. Speed limit affects accessibility and traffic safety, but it probably does not have a direct effect on driving comfort. Road standard, on the other hand, affects both driving comfort, accessibility and traffic safety, and we only want to include the effects that road standard has on driving comfort.

Existing literature and empirical case

The aforementioned factors reoccur in the literature study. We find that there is a very limited literature concerning valuation of driving comfort for different road types. Due to this, we have focused on including related and somewhat relevant topics. A central article for the present report is Hensher and Sullivan (2003), which studies valuation of the number of lanes and curvature of roads. Using a stated preference (SP) study, they calculate willingness-to-pay (WTP) for number of lanes and curvature. We convert the WTP to value of time (VTT) multipliers, and compare these with multipliers from studies of related topics.

The New Zealand Transport Agency has, among other factors, included the quality of road surface in their economic evaluation manual with corresponding VTT for different standards, which we include in our assessments. Furthermore, we have included literature that discuss bicycle infrastructure, mode effects, autonomous cars and VTT of time spent in congestion, that also can be expressed as VTT multipliers.

The report includes a Norwegian empirical case, the E18 Tvedestrand – Arendal. This was a project where a modern 4 lane road was built "parallel" to an old 2 lane road. Since traffic counts exist both on the new and old road after the opening of the new road, we can analyse the route choice of the car drivers. Based on this we can derive behavioural parameters, including the VTT multipliers.

The results of the empirical case are sensitive to the level of VTT one originally assumes. If the VTT is high, one does not need to differentiate as much by road type to explain the travellers choices, as one needs if the VTT is low. I addition, one must make assumptions regarding the extent of how much signage can contribute to explaining that travellers choose the new road. This signage effect is a fixed preference for the new road vs. the old road which is not related to travel time. If the assumed signage effect is high, the VTT multipliers will be lower.

Summary and recommendations

In the recommendations of VTT multipliers, we have given weight to the existing literature and the empirical case of Arendal-Tvedestrand. The literature shows that many of the VTT multipliers are close to 2, for example 2,05 for driving on a road with a very rough and uneven surface versus an even surface. This implies that the VTT of the relevant road type is twice as high as the VTT at the assumed highest comfort level. This must be regarded as a relatively high value and – if translated to route choice – implies that one is willing to accept double the travel time as long as it is possible to achieve better comfort. Literature on heavy congestion finds time value factors just below 2,0 (2,3 in the new Norwegian valuation study), which might suggest that this is not unreasonably high. Meanwhile, comfort effects within public transport are generally lower.

The empirical case indicates considerably lower factors than the literature. Even if one assumes that the choice of travel route is explained solely by differences in VTT related to driving comfort – i.e. no signage effect – the ratio of VTT between the new four lane road and the old two lane road is still estimated to be as low as 1,33. In our recommendations we are staying close to this result, and use the findings from the literature to separate the different road types.

We have also done an adjustment of the VTT multipliers to account for that some of the benefit can be linked to traffic safety, and that this must be separated to prevent double counting in economic appraisal. Because of this, we suggest a downwards adjustment of

the VTT multipliers of 25 % for all road types (outside cities) for use of the VTT multipliers in cost benefit analyses where valuation of risk of accidents is a separate entry.

Based on a combined assessment of our findings, we recommend to use the VTT multipliers in Table S.2 for economic appraisals that differentiate between road types. The time values are specified as factors that express the valuation relative to the time value for a typical journey. We have normalized the multipliers so that the typical journey has a multiplier of 1, while the better roads have a multiplier lower than 1 and poorer roads have a multiplier higher than 1. To convert the time value in kroners for a specific road type, one should multiply this factor by the VTT from the national value of time study.

Table S.2: Recommended time value factors for different road types, relative to the time value of a typical journey.

Road type	Car driver		Car passenger	
	Business travel	Commuting and leisure trips	Business travel	Commuting and leisure trips
Roads in densely populated areas (up to 50 km/h)	1	1	1	1
Four lane road (over 50 km/h)	0.8	0.8	0.8	0.8
Three lane road (over 50 km/h)	0.9	0.9	0.9	0.9
Two lane road with yellow median strip (over 50 km/h)	1.0	1.0	1.0	1.0
Two lane road without yellow median strip (over 50 km/h)	1.15	1.15	1.15	1.15

The multipliers include valuation of driving comfort related to road type. This does not include the valuation of differences in risk of accidents (killed and severely hurt) between different road types. The value of this can hence be included in the economical appraisal without leading to double counting.

Furthermore, the multipliers do not reflect differences in the degree of congestion between road types. The effect of congestion on the value of travel time can hence be included without leading to double counting. Still, we recommend not combining the effect of road type and the effect of congestion. This is because it can give sizable effects on the time value and also because there is probably not many projects where both of these aspects are relevant. If the factors are going to be used in combination, we recommend that they are adjusted downwards, so that the combined effect does not lead to extreme outcomes.

For projecting of unit values to future years, we recommend using the multipliers above regardless of the year of analysis, combined with values of travel time that are real price adjusted in line with current practice.

We emphasize that our estimates are uncertain, and recommend more research on this topic. This should include collection and analysis of data on the route choices of car travelers.