Institute of Transport Economics
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Summary

Public Transport: Perception contra realities in access and usage

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The National Travel Survey (NTS) 2013/14 and the publicly available database for public transport's timetable provides an interesting dataset to compare the perceived and factual public transport supply in Norway. Supply is interpreted here as the frequency in peak hours and off-peak hours. The descriptive data analysis of commuting trips shows a certain a degree of convergence on the public transport supply as indicated by the respondents and as extracted from the timetable database, thus highlighting that the respondents in the NTS had a realistic impression of the public transport supply available near their place of residence. A multivariate analysis was also undertaken in this study. Among the major findings is the fact that gendered differences persist in perception of commuting time as well. Men estimate a lower travel time on public transport than women , when all other factors are controlled for. Variables associated with car usage (driving license, number of cars in the household and parking facilities at workplace) had a strong and statistically effect on the estimated travel time on public transport in Nord-Jæren, but no such effects were significant for Oslo municipality. The perception of both public transport supply and travel time varies hugely between urban areas with a modern and mature public transport culture and areas lacking in such culture such as suburban areas.

Problem statement

The National Transport Plan of Norway has a clear mandate for the Norwegian urban regions to absorb entire future traffic growth on sustainable transport modes with zero percent increase in car traffic. It is indeed a very ambitious goal. One of the concrete ways to go about bringing this change is analysing the potential for change in work trips and potential for shifting commuting trips on public transport. Given that commuting trips are concentrated in time and space, it is relatively easy to plan specific public transport supply to cater to these trips considering the population projections, planning of employment centers etc. Further, in order to design future public transport supply, it is imperative that the current state of affairs is thoroughly examined. This study delves into one particular aspect, the ways in which public transport supply is perceived by the inhabitants of urban region of Nord-Jaæren and Oslo municipality and contrasts these subjective results with the objective realities.

Perceptions in this study deal with questions which have been put in the NTS 2013/14 regarding travel time to work on public transport and available frequencies on the nearest transit stop.

The main problem statement that this project has attempted to comment on is as following: What is the difference between the perceived and real frequency and travel time on public transport and which socio-economic factors have a significant affect over these differences?

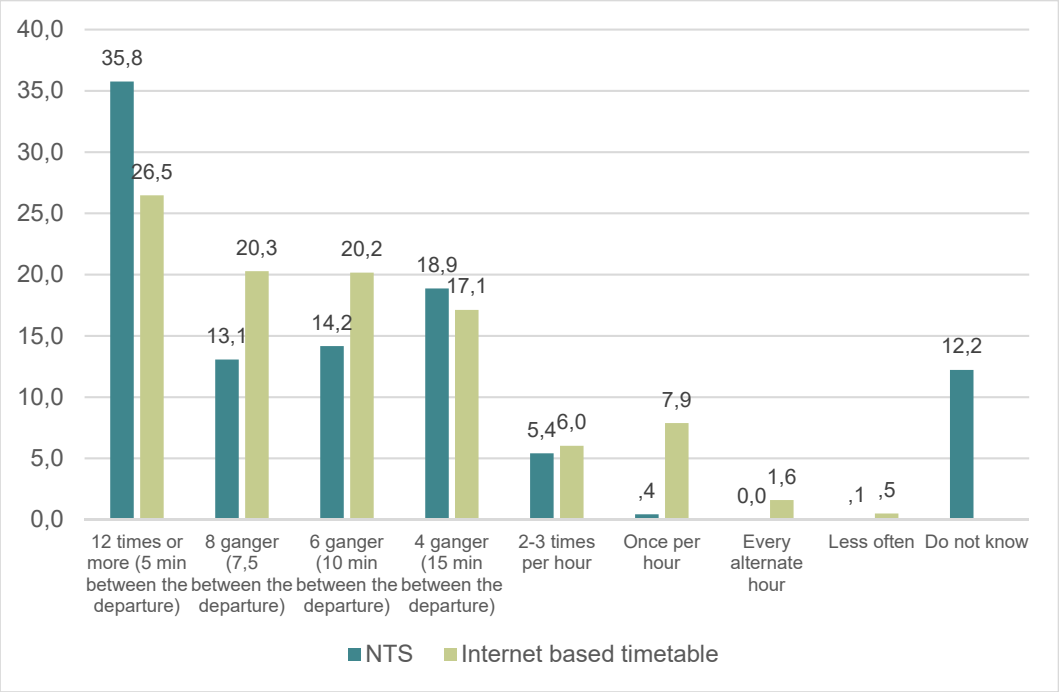
The project is divided in the following four parts:

- An overview of trip distribution, modal split and trip purposes for Nord-Jæren and the municipality of Oslo for 2013/14.

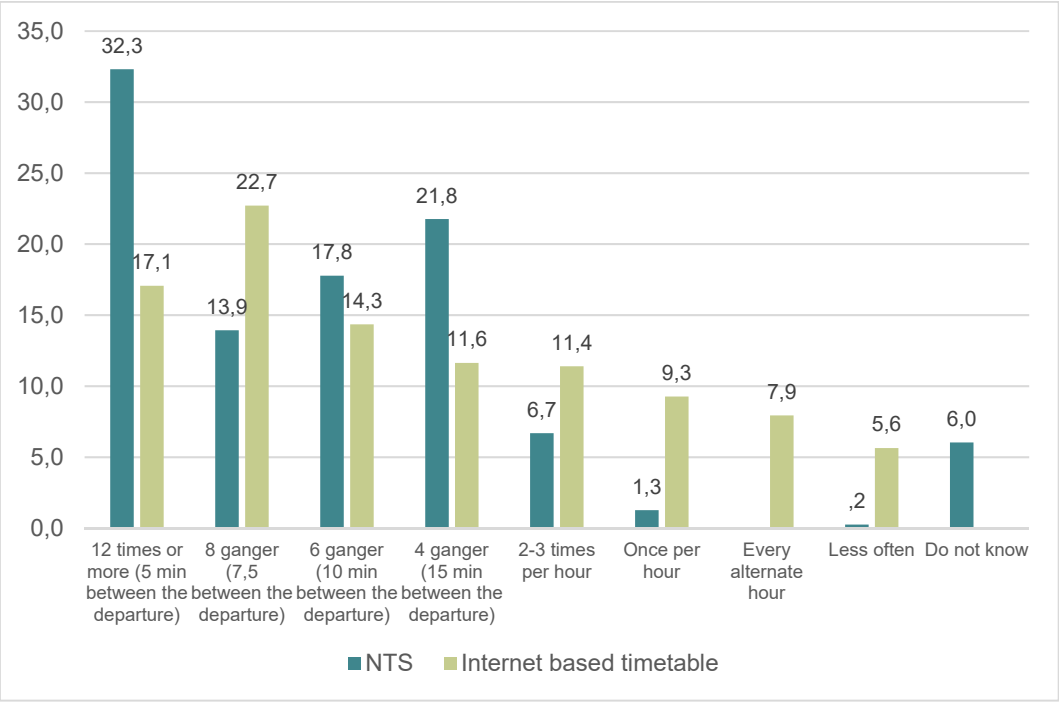
- Extraction of start and end point coordinates of the trips registered in NTS 2013/14 for the case areas, and coupling of these coordinates to extract information on public transport frequency and travel time.
- Calculating the difference between the perceived and the actual public transport supply disaggregated by age and other socio-economic variables. A detail mapping of the important variables through both descriptive and multivariate analyses.
- Constructive comments on future designing of public transport supply based on the results of this study.

Estimated public transport frequency in Nord-Jæren and Oslo municipality

On exploring the relationships between the public transport frequency specified by the respondents in the NTS and frequency obtained through the national database, it was found that results varied between the two case studies. A clear trend towards over estimating the higher frequency categories was found among the RVU respondents in the Oslo municipality. While the timetable indicates 26% of respondents having a frequency of 12 departures or more (5 min. between departures) during the rush hour, 36% of the NTS respondents answered that this frequency category (or higher) is available to them in the peak period (07- 09). This difference may have risen due to the variation between the stops that the respondents regard as the nearest stop locations (in the physical sense) but which in reality might not have been the nearest transit stop. The respondents could be stating the frequency available at the transit stop which they most frequently use instead of what is physically closest to their home. In Oslo, for example, great flexibility exists in choosing between different forms of public transport modes. If a person prefers to use the subway instead of the bus, it seems that he or she has most probably reported the frequency available on that particular subway station instead of the nearest bus stop. For the second and third frequency category - 8 times (7.5 min. between departures) and 6 times (10 min. between departures) - NTS respondents estimates and that given by the national database showed approximately 6% percentage point difference. There is, however, a major discrepancy between the estimated and reported frequencies for the category of "once per hour." Whereas the national database reports that about 8% of the respondents will have this frequency available at the nearest stop, only 0.4% of NTS respondents reported this frequency category. In the NTS, 32% of the respondents stated that the transit frequency available at the nearest stop falls in the best category but the national database reports that only 17% of the respondents fall in this category. Something similar was observed for the category "quarterly departures per hour" where 22% of the NTS reported positively for this category, while the corresponding figure from the national database was only 12% during the off-peak hours. The lowest frequency category “once per hour," "every second hour" and "less often" are underreported.



Figur S.1: Departures per hour between 07-09, nearest transit stop. Oslo municipality. Percent.



Figur S.2: Departures per hour between 09-15, nearest transit stop. Oslo municipality. Percent.

Nord-Jæren is far removed from the case of Oslo as trips made on public transport are severely restricted in this region. The region remains dominated by car-based mobility. This dominance can also be translated as lack of respondents' knowledge when it comes to identifying the correct frequency categories and travel times estimates.

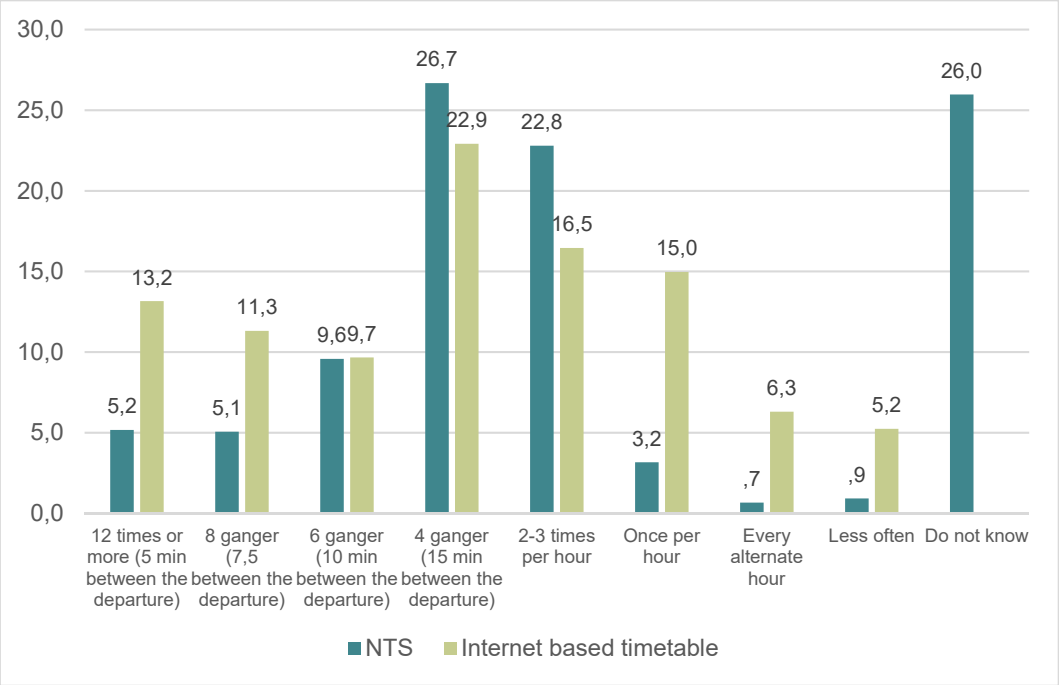
Unlike Oslo, there exists a systematic underestimation of the category with the highest frequency based on the internet database contra that reported by the NTS respondents. This applies to both peak and off-peak hours. The timetable reports that nearly 13% of respondents live near a transit stop where the reported frequency during peak hours lies in the category of "12 or more per hour", but as per the NTS respondent's evaluation, only 5% fell in the same category. For off-peak hours, NTS reports that only 4% of the respondents fall in the frequency category of "12 or more (5 min. between departures)" compared with 10% reported by the timetable.

It is interesting to note that the second highest frequency category - 8 times (7.5 min. between departures) is also underestimated by the NTS-respondents for rush hour, but that they match perfectly for data outside the rush hours. The results suggest that respondents in Nord-Jæren possess a greater insight into the public transport supply during off-peak hours. It is difficult to provide a good explanation of why the data correlates better for off-peak hours, but the results could most likely an outcome of respondents educated guess.

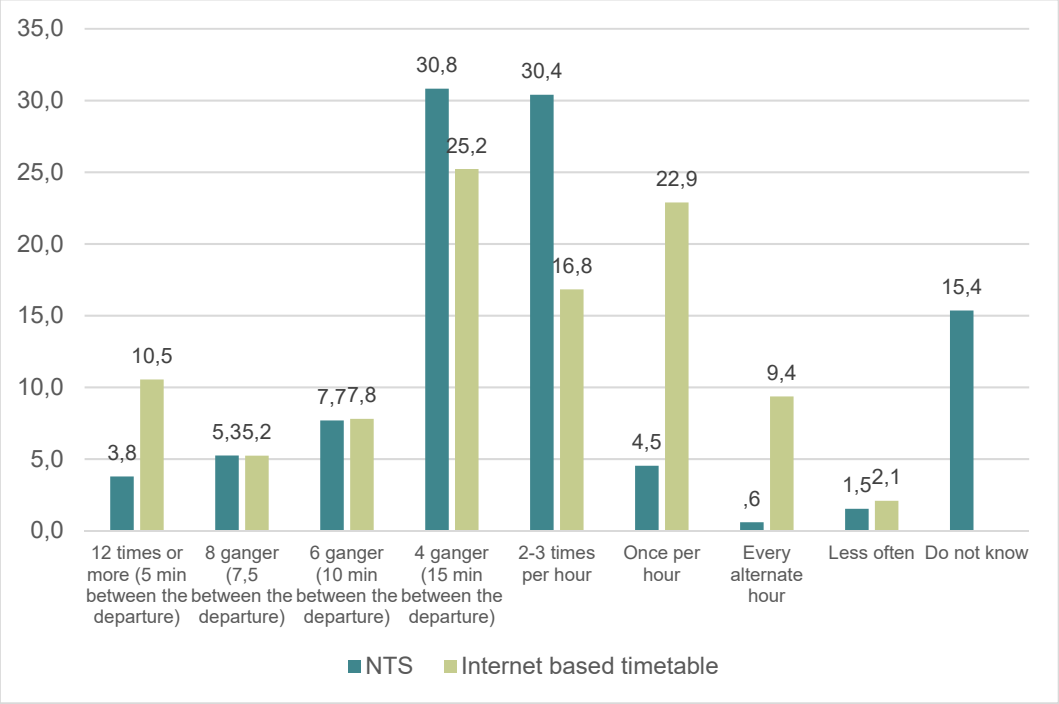
For categories "6 departures per hour", there is a scarce 0.1 percentage point difference between the timetable data and NTS estimates for both peak and off-peak hours. The deviations are a little higher for category 4 departures per hour (15 min. between departures). Here, the timetable database reports that 23% of the respondents fall in this category during the rush hour, while the corresponding figure is 27% among the NTS-respondents. There exists a relatively similar deviation for off-peak hours, where the timetable indicates that 25% of respondents fall in this category while 30% of the NTS respondents acknowledge this frequency category.

One of the most striking results of Nord-Jæren is the relatively large discrepancy between the timetable's data and the NTS estimates regarding the frequency category of "once per hour" or lower. For peak hours, the timetable database indicates that 15% of passengers will have a departure frequency equal to "once per hour" from the nearest transit stop, but only 3.2% of respondents reported the availability of this frequency category. Similarly, the timetable database suggests that 23% of the respondents should have the "once per hour" frequency available during off-peak hours but among the NTS respondents, this share is as minimal as 4%. The discrepancy indicates an almost complete lack of knowledge about the actual public transport supply in low frequency category. This is further supported by the fact that nearly a quarter of respondents (26%) reported "do not know" regarding the departure rate at the nearest public transport stop during rush hour, while it is 15% outside the rush hour. The corresponding figures for the category "do not know" in Oslo is located at 12% during peak hours and 6% during hours outside rush hour.

One can conclude that there exists both a combined lack of knowledge of public transport supply and a systematic underestimation of high frequency availability in Nord-Jæren.



Figur S.3: Departures per hour between 07-09, nearest transit stop. Nord-Jæren. Percent.



Figur S.4: Departures per hour between 09-15, nearest transit stop. Nord-Jæren. Percent.

Estimated commuting time with public transport in Nord-Jæren and Oslo municipality

Data analysis from the NTS highlights that the average commuting time for public transport users is 12 minutes higher than the average commuting time of car-drivers in the municipality of Oslo. Car-drivers' estimate of travel time by car and actual travel time by car converge, as the actual travel time of 19 minutes and the estimated travel time of 21

minutes are only 2 minutes apart. The travel time estimate of the same group (car-drivers) if they had used public transport shows a quantum leap in commuting time. The average commuting time on public transport would be 100% higher than the travel time by car (41 minutes). Looking at the estimates provided by the public transport users, this group has an actual commuting time of 31 minutes and an estimated commuting time of 30 minutes. In other words, the actual and estimated commuting time for both the groups – car-drivers and public transport users – converge.

Since the estimated travel time by car is 20 minutes for the public-transport users, it implies that the public transport users would be saving 10 minutes each way on their commute if they switched from being public transport users to car-drivers. It also shows that public-transport users had less to gain by switching to a car-based commuting (10 minutes each way) than car-users, who would (on average) lose 22 min each way by switching to public transport.

It was also found that the estimated commuting time on public transport, as provided by the NTS dataset, converged well only with the on-board travel time provided by the internet based timetable. This suggests that the NTS-respondents do not include access and egress time to transit stop while providing the travel time estimates, even though the question put to them in the NTS solicited the total travel time. Considering this crucial finding, only on-board time was considered for further analysis.

Findings from Nord-Jæren exhibited patterns similar to the case of Oslo municipality. An average difference of about 13 minutes exists between the commuting time of car-drivers and public-transport users, as extracted from the NTS 2013/14. This difference increases to 15 minutes when we compare the commuting time estimates given by these two groups. The timetable, however, reports that this difference is 4 minutes.

As per commuting by car is concerned, both car-drivers and public transport users estimate that they will, on average, use 17 minutes on commuting by car. Changes in commuting time from 17 minutes to 45 minutes (estimated by car-drivers) or 41 minutes (provided by the timetable) represents increase of approximately 26 minutes (each way) for car-drivers. If this difference forms the basis for further discussion, it seems unlikely that drivers will switch to public-transport for commuting purposes. Public-transport users can save 13 minutes (based on their own estimate) or 20 minutes (as given by the timetable) if they switch to car for commuting purposes.

Table S.1 shows that car-drivers' estimate of commuting time on public transport has a deviation of approximately 4 minutes in Oslo. Surprisingly, this deviation is less than 1 minute among the respondents in Nord-Jæren. The result indicates that drivers in Oslo, on average, overestimate the journey time by public transport, but the result could also be an outcome of an estimation error in the timetable. It is difficult to determine the cause of this deviation with certainty.

When it comes to deviations reported by the public-transport users, table S.1 and S.2 highlight that the public-transport users in Oslo, on average, estimate the commuting time to be only a minute less than the figure reported by the timetable. Public transport users in Nord-Jæren have a travel time estimate of 7.3 minutes less than the corresponding figure reported by the timetable.

Tabell S.1: Difference between the estimated and reported travel time on public-transport. Estimated - NTS 2013/14. Reported - Internet based timetable. Disaggregated by users of different transport modes. Oslo municipality. Time in minutes.

Main mode	Mean	N	Std. Deviation
Til fots	0,6	332	18,2
Sykkel	-2,7	205	15,4
MC/moped	-1,5	6	11,9
Bilfører	3,8	531	18,2
Bilpassasjer	1,3	38	13,6
Kollektivt	-1,0	955	15,6
Total	0,4	2068	16,8

Tabell S.2: Difference between the estimated and reported travel time on public-transport. Estimated - NTS 2013/14. Reported - Internet based timetable. Disaggregated by users of different transport modes. Nord-Jæren. Time in minutes.

Main mode	Mean	N	Std. Deviation
Til fots	1,1	74	27,3
Sykkel	-9,4	129	21,8
MC/moped	-8,7	16	21,6
Bilfører	0,7	620	25,6
Bilpassasjer	-9,9	33	25,1
Kollektivt	-7,3	127	20,6
Total	-2,1	999	24,9

Multivariate analysis

A multivariate analysis, based on linear regression analysis with OLS estimation method, was conducted in this study. This was done with an aim to identify the existence of significant differences between perceived and actual work travel time (estimated from the timetable) taken on public transport for commuting purposes. The focus of the analysis was to identify how the differences between the expected (as reported by the NTS-respondents) and the estimated travel time (from the timetable) differed according to certain key variables (the main means of transport, income, education, gender, etc.). A combined snapshot of the results from Nord-Jæren and Oslo municipality is summarized in the following points:

– Men estimate travel time on public transport to be lower than the women, both in Oslo and in Nord-Jæren.

– There exists statistical differences between travel time estimates by the respondents with respect to household income and education in Oslo municipality, but the same was not found in Nord-Jæren.

– High population density was found to be significant in both Nord-Jæren and Oslo, but the relationship had opposite indications for the two case areas.

– Possession of driving license, no. of cars in the household and parking availability at workplace was found to have statistically significant effect on the travel time estimates in Nord-Jæren, but no such effects were found for Oslo municipality.

– though distance to the nearest transit stop was not found to be significant for both cases explored in this study, we posit that this could have arisen due problems related to

estimation of the correct distance on non-motorized paths.
– Age of the respondents was found to have a statistically significant effect on travel times estimates among the respondents of Nord-Jæren but no such effect was found for the case of Oslo municipality.
– The group with full-time employment status had a lower deviation for the travel time estimates in Nord Jæren, while the estimate was marginally higher in Oslo.

Summary and the way forward

This study firstly explored the extent to which public transport is used in Nord-Jæren, and compared this with the municipality of Oslo, which has by far the highest public transport usage for commuting purposes in Norway. The comparison of public transport supply (frequencies at the nearest stop extracted from timetable and estimates by respondents in the NTS) confirms and emphasizes that there are large discrepancies between Oslo and Nord-Jæren. It was found that the subjective assessment of available frequency could possibly have an effect on the use of public transport in Nord-Jæren. In other words, even if people live in a neighborhood with good public transport supply, they will not actively use public transport if they remain unaware of this offer.
Secondly, this study showed that the objective and estimated commuting time on public transport corresponds, suggesting that people, at large, have a realistic perception of the travel time on public transport to reach their respective workplace. Time-savings seem to be a strong reason to use the car for commuting purposes. This applies particularly to the NTS respondents from Nord-Jæren, where commuting by public transport, on average, takes double the amount of time as compared to driving.

To facilitate a shift from car-based to public transport based commuting, both national agencies and local authorities need to focus on the following:

- Restructuring of the traditional public transport supply, which currently relies on connecting point A to point B, to become a more dynamic system. This dynamic system should ideally resemble the car-based system in terms of travel time, convenience, supply, planning, and comfort. Linking of demand-based feeder routes to high-speed main line could be one option. Potential of solutions like ride-sharing should also be further explored.
- Implementation of technologies that would make it easier for public transport users to utilize on-board time on meaningful activities like working (on their laptop or other relevant electronic gadgets), charging of electronic devices, reserving seats online etc.
- Exploring technological possibilities to ensure that future public transport supply is optimized for both time-savings and ease of usage. For example, instead of increasing bus routes that have a wide coverage, resulting in increased travel time, transport authorities could look into developing feeder systems to connect to high-speed major public transport lines. Such feeder systems can be developed in multiple formats – by developing better infrastructure for cycling, bicycle parking facilities at the main transport hub, standardized apps for ride-sharing etc.