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Author: Katrine Næss Kjørstad
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Summary:

Passenger preferences

Experiences from Moss, Grenland, Kristiansand, Tromsø and Ålesund

The Norwegian Trial Scheme has supported 511 projects

The Norwegian Trial Scheme for Public Transport was established by the Ministry of Transport and Communications in 1991 and continued in 1992-96. Over the five-year period 1991-95, a total of about NOK 461 million has been allocated to 511 experiments (Frøysadal 1995).

Overall evaluation of the Trial Scheme

On the basis of the majority of the 1991/92 experiments, *overall* analyses of the Trial Scheme have been conducted with regard to the 1991 experiments (Norheim et al. 1993) and the 1991/92 experiments (Renolen and Hammer 1995). The overall analyses are based on a data base for the postcard surveys (the minimum evaluation) carried out as part of the Trial Scheme.

Whereas overall evaluation reports were prepared relating to the 1991 and 1992 experiments, the 1993 evaluation has been targeted on the following areas:

- *Market analyses of public transport passengers' preferences (the present report)*
  The market surveys are based on conjoint analyses carried out in Moss, Skien/Porsgrunn, Kristiansand, Ålesund and Tromsø in 1994. The market analyses provide a basis for analysing the willingness to pay for the new services and the measures initiated under the Trial Scheme in the 1991-93 period, and for calculating the benefit to passengers for use in cost-benefit analyses. The market analyses likewise provide a basis for calculating the usefulness of extending the measures adopted under the Trial Scheme and for establishing priorities among various new measures which it would be desirable to initiate.

- *Effects of public transport measures on demand (documented in working papers and special publications)*
  The analyses of the effects on demand take data obtained in the 1991-1993 experimental projects as their points of departure.

The report can be ordered from:
Institute of Transport Economics, PO Box 6110 Etterstad, N-0602 Oslo, Norway
Telephone: +47 22 57 38 00 Telefax: +47 22 57 02 90

Market analyses of the preferences of public transport passengers

Most measures under the Trial Scheme entail higher costs for public transport companies. That makes it important to do full cost-benefit analysis of the projects, including passengers' benefits and external effects. It is also important to find out which measures produce the largest gains, given the financial constraints on public transport.

Earlier market surveys under the Trial Scheme have concentrated on testing how successful marketing campaigns have been in reaching the public. Thirteen such surveys have been carried out in the 1991-1995 period. They provide a good basis for conclusions concerning how best to publicise public transport (Renolen and Hammer 1995).

The aim of the present analysis is to arrive at data which can serve as basis for full cost-benefit analyses of public transport measures adopted with support under the Trial Scheme in the 1991-93 period. To make such calculations, one needs knowledge concerning the benefits to passengers (passenger assessments) of various measures. The 1994 market surveys were accordingly designed as conjoint analyses, since this is a method in which hypothetical questions are used to calculate how passengers value various measures.

The Ministry of Transport and Communications funded the planning of the survey and met half the costs of collecting the data, and the participating regions covered the other half of the data collection. Invitations to participate in the survey were sent to 14 medium-sized urban regions, five of which replied that they were interested: Kristiansand, Moss, Skien/Porsgrunn, Tromsø and Ålesund.

This report presents the principal results of the conjoint analysis and is a basis for deciding which main categories of measures merit further investment.

The varying valuation of service improvements between the cities can be a result of different passenger groups and travel purposes in the five cities. The quality of the service will also vary between the cities. The data from this survey will make it possible to do market segmentation studies to investigate the importance of individual and area-specific background factors for the variation in the passengers' preferences. These studies will hopefully give a better basis to generalise the observed variation in the public transport users' preferences and valuation of service improvements in different areas.

The results also lend themselves to the establishment of more detailed priorities among various kinds of transport service, which would require further analysis.

The benefit to passengers of the public transport measures

The results of the conjoint analyses can be used to calculate the benefits obtained from various measures and priorities among the measures. Public transport measures can have numerous different consequences. The main effects of the package of measures can very roughly be divided into effects on public transport and effects on society (Table S.1).

Previous cost-benefit analyses show that the benefit of a measure to public transport passengers is the largest item in a social cost-benefit account (Larsen 1993). In addition, competition with other means of transport, for instance the relative travel times by car/public transport or walking/cycling/using public transport, has a significant impact on whether or not measures have any impact on different mode choices (Klæboe 1993). Emphasis should therefore be given to studying:

1. The benefit of the new service to passengers
2. The costs and revenues connected to the measures
3. The potential for changes in choices of means of transport.

Table S.1: Example of an account showing social benefits and social costs of an investment in public transport

Effects on public transport	Effects on society
Costs of the measure to public transport companies	Public investments following from the measure
Gains from more efficient operations	Gains to society from less congested roads
Internal environmental gains from more environment-friendly operations	External environmental gains from the measure
Benefits to passengers of the measure	Costs of the measure to other travellers

The present report concentrates on item 1, the benefit to passengers. A description of the passengers and of the urban structures is a necessary basis for interpreting the assessments we find and explaining the differences between them. Such a description also makes it easier for the urban regions taking part in the survey to make use of the data in their further work on cost-benefit calculations. It is also important to enable other regions to compare themselves with the participating regions, so as to be able to use some of the assessments we have found in their own calculations of the benefits of the measures they have already adopted and in deciding on new measures with a view to improving their public transport services.

Conjoint analyses based on a specific journey

We have chosen to use a method known as conjoint or Stated Choice analysis. Such analyses are based on hypothetical choices. To make the situation as realistic as possible, the method uses a customised design based on a specific journey made by the respondent. The respondent is then given a choice between various "service packages" relating to that journey.

The persons interviewed make several choices between different packages. In each package, we have described different standards of public transport. The choices made between the packages provide a basis for determining which factors are considered most important. On the basis of the choices, we calculate how much for instance the price, the travel time, the service frequency and the walking time means in the choice of the means of public transport.

We chose to interview passengers who use public transport regularly. This ensures that those completing the questionnaire are reasonably familiar with the standard factors included in the survey. It is also important to find out which services are preferred by different groups of travellers, with a view to keeping their custom in the future. At the same time, this is a useful platform for attracting *new* passengers to public transport.

27 per cent use public transport at least once a month

The target group in the survey comprised persons over 16 years of age who had travelled by public transport at least once in the past month. This varies from 20 per cent of the over-16 population in Grenland to 47 per cent in Tromsø (see Table S.2). Of those who travel by public transport, a relatively high proportion do so frequently. An average for the five towns shows that 84 per cent (of our sample) travel by public transport at least once a week.

Table S.2: Population aged over 16 and percentage who used public transport at least once in the past month in Moss, Grenland, Kristiansand, Tromsø and Ålesund

	Moss	Grenland	Kristiansand	Tromsø	Ålesund
Population over 16	20,436	64,085	51,784	40,380	28,502
% using public transport once in past month	22	20	31	47	29

For public transport companies to be able to tailor-make services for their customers, they need to know who the passengers are.

Public transport passengers in the five towns differ little from those we find elsewhere in the country. The majority are women and adolescents, and over half the journeys are to or from work or school. The report gives a more detailed description of the characteristics of the passengers in the five towns and the differences between them.

The car is the chief alternative

Of the public transport passengers, 42 per cent would have travelled by car if they had been unable to use public transport, either driving themselves or riding with someone else (Figure S.1). Differences between the passengers in the various towns are slight. It is of course for longer distances that the car is the chief alternative; over shorter distances, walking or cycling are important alternatives.

It is worth noting the high percentage stating that they are captove riders, i.e. that they *must* use public transport. In Tromsø and Kristiansand every fourth and every fifth passenger respectively state that they have no alternative.

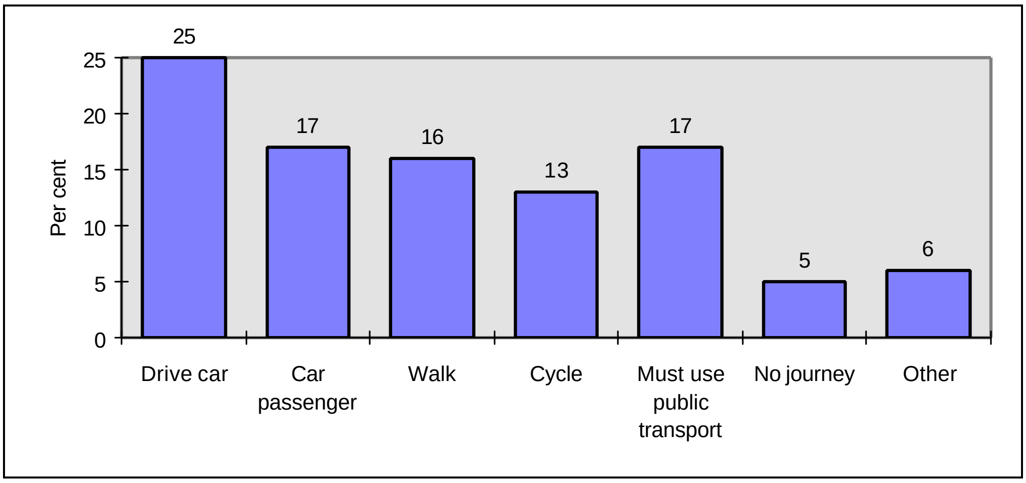

Figure S.1: Alternative transport if the journey in question could not be made by public transport. Percentage of public transport users in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994. N=989.

Cars in great demand

A good half of the public transport passengers have cars and driving licences, and there are many conflicting demands for the use of the car within households. Three out of four public transport passengers with driving licences and a car in the household share the use of a car, while only one in four has unlimited access to a car. Reduced car use by one member of a household can thus result in increased car use by others.

One out of four passengers would have driven if no bus been available. The main reason for not making the journey in question by car was that someone else in the household was using it, 37 per cent. This indicates considerable competition for the use of the car within households.

Many pay too much for their journeys

Half the public transport passengers buy single tickets for their journeys, despite travelling often. An average of 22 per cent are consequently paying "excess fares" for their journeys.

Poor evening services

Most of the public transport users in the five towns rarely travel by public transport in the evening. The reasons are principally that they find it more convenient to go by car and that the scheduled services are unsatisfactory. Insecurity is given as a reason by only 4 per cent on average for all five towns.

Difficulties in getting on and off reduce the bus use

An average for all the towns one in four passengers have or have had difficulty getting on or off the buses. The reason why the proportion who have had no problems is so high is that nearly half of them have refrained from using public transport for certain types of journey. For instance, they choose other means of transport modes when travelling with children or taking a pram or when they have a lot to carry.

Among those who do report having difficulties, every third person makes less use of the bus. The main source of difficulty (affecting 41 per cent) is taking a pram. Every fourth person reports difficulties due to impaired mobility.

Low-floor buses, in other words, are not a service merely for the elderly or those with impaired mobility, but principally a way of improving access to public transport for all categories of passengers.

Buses are often late, and many passengers find the information at stops inadequate

Punctuality is important in a service and in forming people's judgements of the bus as a reliable transport mode. An average of 17 per cent of the passengers replied that buses were delayed, by an average of nearly 5 minutes.

One quarter of the passengers found no timetables at bus stops, and even where found, they do not always contain sufficient information. Nearly half the passengers who have timetables at their stops can not see when the bus leaves from the stop concerned, but only when it leaves from the end of the line.

Bus passengers set a relatively high value on shelters

Over half the passengers began their public transport journeys from stops where there are no bus shelters.

How busy stops must be in terms of numbers of passengers to justify providing shelters or roofed stations is a financial question. The results show that willingness to pay for shelters at stops varies from NOK 0.40 per journey in Tromsø to NOK 2 per journey in Kristiansand.

The valuation of shelters thus varies from one region to the next, but although it is relatively low in Tromsø, shelters at stops would be regarded as a benefit by most people and are accordingly a relatively important factor.

The number of boarding passengers needed is in fact so low that consideration should be given to providing 100 per cent shelter coverage in most regions. This can be illustrated by seeing how many boarding passengers there must be at a stop before the benefit exceeds the cost of a new shelter. Assuming that a shelter costs NOK 20 per day including capital and maintenance costs, we find that the cost-benefit limit is from 10 boarding passengers per day in Kristiansand to 50 in Tromsø.

Travel times are made up of different parts

In order to reduce public transport travel times, one must consider all stages of the journey. On the average for the five towns, a public transport journey takes 33 minutes from leaving home to reaching the final destination (Table S.3). About 19 minutes are spent on board the vehicle, 10 minutes are walking time, and 4 minutes are waiting time at stops. Walking, waiting and travel times do not vary much between the five towns, but passengers in Grenland find all stages of their journeys taking a little longer than in the other towns and adding up to nearly 43 minutes.

Table S.3: Public transport journey times, in minutes. Stated choice analysis in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994

First means of transport	Walking time to stop	Waiting time at bus stop	In-vehicle travel time	Walking time from stop	Total travel time	Number of persons
Moss	4.6	4.7	16.3	6.4	32.0	198
Grenland	5.4	4.8	21.7	10.7	42.6	200
Kristians.	4.6	2.9	19.2	0.3*	27.0	192
Tromsø	4.0	4.2	17.7	8.5	31.4	199
Ålesund	4.0	4.0	18.9	5.3	32.2	199
Average	4.5	4.1	18.8	5.7	33.1	Tot.988

* Probably systematic error in data collection

We have calculated the value given by passengers to shorter journey times

On the basis of the stated choice analysis, we can calculate the effect of lower fares, reduced travel times, walking times, higher frequency etc. on the likelihood of choosing various public transport services. This means that we can indirectly estimate passengers' willingness to pay for reduced travel times, walking times or higher frequency by calculating how much the price needs to be cut to produce the same effect on demand.

Figure S.2 shows how much on average passengers are willing to pay for shorter journey times. As we see, on the average for the five towns, greater value is attached to walking time, waiting time[1] and time taken transferring from one means of transport to another than to reduced travel times. If there is standing room only, however, time on the conveyance counts more than the other factors.

The value placed on journey time standing is NOK 40.50 per hour. That means that passengers are willing to pay NOK 6.75 for a 10-minute reduction in their journey time if they have no seat available. The valuation of transfer time corresponds to NOK 6.50 for 10 minutes extra spent waiting to transfer. In other words, journeys on which passengers have to transfer between modes are very little attractive.

[1] Average waiting time for next departure, i.e. half the interval between the departures

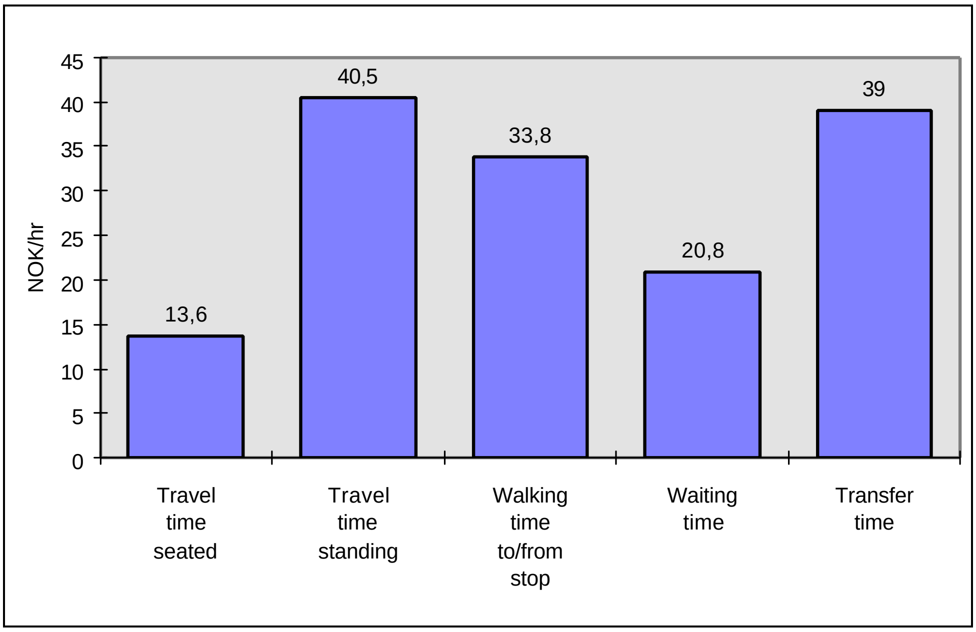

Figure S.2: Valuation of shorter journey times. NOK/hr. Stated choice analysis in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994. Average for all areas. N=989

Existing public transport services influence valuations

Public transport passengers on short journeys, up to 15 minutes on the conveyance, and with seats, appear to value time saved less than those on longer journeys. Passengers who have to stand see this as a serious inconvenience regardless of the length of the journey (Figure S.3).

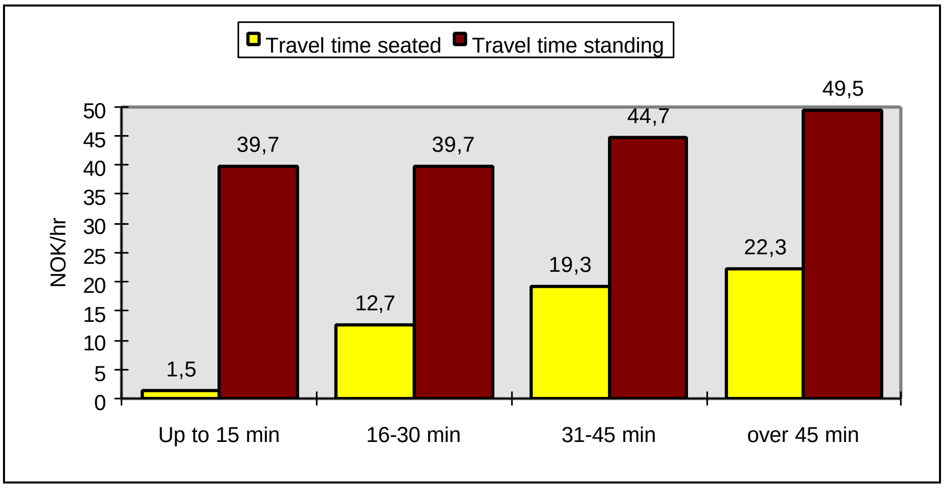

Figure S.3: Valuation of shorter travel times, according to the length of the journey and whether or not the passenger has a seat. Stated choice analysis in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994. N=988

How higher frequency is valued depends on the nature of the existing service. The average frequency in the present material as a whole is 33 minutes between departures. A frequency as low as this implies that waiting time accounts for a considerable proportion of the total journey time (Table S.4). That waiting time adds up to more than the in-vehicle time in Grenland may help to explain the low public transport percentage in this region.

Table S.4: Waiting time and travel time in minutes. Average. Stated choice analysis in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994. N=989.

	Moss	Grenland	Kristiansand	Tromsø	Ålesund	Ave.
Minutes be tween departures	29.5	48.8	28.4	26.1	32.7	33.2
Waiting time	14.8	24.4	14.2	13.1	16.4	16.6
In-vehicle travel time	16.3	21.7	19.2	17.7	18.9	18.8
Waiting time as percentage of in-vehicle travel time	91%	112%	74%	74%	87%	88%

Waiting time marks an important distinction between journey times using private and public transport. High public transport frequencies reduce the difference, but where frequencies are low, waiting time accounts for a considerable proportion of the total journey time. The longer the travel time on the conveyance, the lower the proportion of in-vehicle waiting time. On short journeys, of under 10 minutes, waiting time was 1.7 times as long as the in-vehicle travel time (Figure S.4).

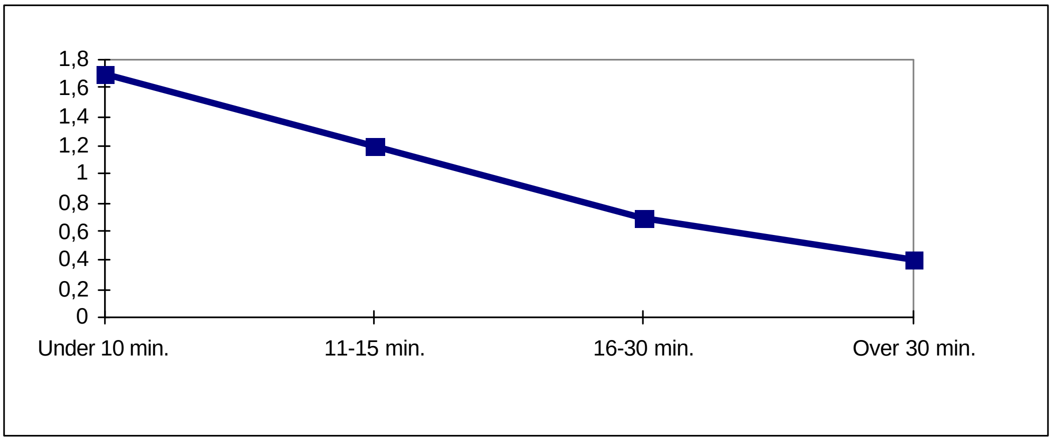

Figure S.4: Waiting time in proportion to travel time on the conveyance according to the time spent aboard the conveyance. Stated choice analysis in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994. N=988.

Better public transport

On the basis of the value placed by passengers on time and average journey times in the five towns, we have calculated the *weighted journey times* of the public transport passengers (Table S.5). The table shows the weighting of travel time standing, walking time, waiting time and transferring time relative to travel time seated (equal to 1.0). This gives a basis for establishing which measures would mean most to the passengers in each of the five towns.

Table S.5: Relative weighting by public transport passengers of travel times, walking time, waiting time and time spent transferring between means of transport. The basis is travel time seated (=1). Stated choice analysis in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994.

Journey time component	Moss	Grenland	Kristiansand	Tromsø	Ålesund	Ave.
Travel time seated	1	1	1	1	1	1
Travel time standing	2.9	2.8	4.9	2.3	3.1	3
Walking time	2.1	2.1	4.6	2.2	2.4	2.5
Waiting time	1.4	1	2.6	1.6	1.9	1.5
Transfer time	2.3	2.5	2.6	2.8	4.3	2.9

Many passengers mention higher frequency as a measure which they believe would have a considerable impact in persuading more people to use public transport. The measure is costly, however. We have therefore assessed the relative importance of various improvements in standards by calculating passengers' willingness to pay for the measures (Table S.6). This shows among other things that the value set on a 15 minute reduction in intervals between departures varies from NOK 1.70 per journey in Grenland to NOK 5 per journey in Ålesund. The highest willingness to pay relates to avoiding having to stand and avoiding a 10-minute wait when transferring from one means of transport to another.

Table S.6: Relative valuation of various improvements in standards, in terms of ticket prices (NOK/journey). Stated choice analysis in Moss, Grenland, Kristiansand, Tromsø and Ålesund, 1994. N=989.

Improvement	Reduction in ticket price (NOK/journey) to achieve corresponding effect				
	Moss	Grenland	Kristiansand	Tromsø	Ålesund
Avoid standing for 15 minutes	5.70	5.70	10.70	4.10	11.00
5 minutes shorter walking time	2.20	2.30	4.10	2.40	4.20
15 minutes shorter intervals between departures	2.30	1.70	3.60	2.60	5.00
Avoid transfers	3.70	3.60	4.80	3.20	8.30
Avoid 10-minute wait for transfer	4.50	5.30	4.60	6.10	14.70

Competition with other transport modes

The fact that waiting time play an important role on shorter journeys also affects competition between public transport and walking/cycling. Given an interval of for instance 1 hour between departures, one can walk or cycle a relatively long distance before public transport becomes competitive.

This shows that general public transport measures will have little impact on mode choices, and especially for shorter trips. What are needed, therefore, are targeted efforts in areas with the most favourable conditions for competition, applying the measures which give passengers the greatest benefits. On the basis of the present report and of data concerning various possible measures (how many are affected, gains in time, costs of the measures, etc.), it is possible to calculate which types of measure will give passengers the greatest benefits, subject to the modes available.