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Summary:

Travel activities of employees

An analysis of factors influencing car arrangements, parking conditions, frequency of business travel and modal choice for commuting

The estimation and use of logit models

In a previous project (Transport in the course of work - PIA, Stangeby 1997), a travel survey was conducted. The sample was taken from employees in the Oslo-region and the respondents were questioned about

- ✓ Driving licence and car accessibility
- ✓ Branch of employment, position and working conditions
- ✓ The trip to work
- ✓ Diary for the travel in the course of work (business travel)
- ✓ Use of car in the course of work, car subsidy arrangements, and parking conditions
- ✓ Other background information about the respondents

In this report the data form PIA is used to estimate several logit models. Models are formulated and estimated for the following choices:

- ✓ The employers' supply of different car subsidy arrangements
- ✓ The supply of parking at the workplace
- ✓ The choice of mode for travel to work
- ✓ The choice of frequency of travel in the course of work
- ✓ The choice of mode for travel in the course of work

The advantage of applying logit models in this type of analysis is that the explanatory power and impact of a wide range of variables can be analysed simultaneously.

The frequency of travel in the course of work is mainly explained by the employees position at work

The model estimates the probability of making 0, 1, 2 and 3 or more visits during the working day.

There is not any strong connection between the frequency of travel in the course of work, and the branch of employment and the localisation of the workplace. The main explanatory variables are found amongst the personal characteristics of the employees. The probability of making a work related visit is strongly correlated

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with the number of hours the employees work per week. The probability of travel in the course of work increases as the number of working hours increases. The employees' position in the firm is also a very important variable. Self-employed have a high probability for travel in work and especially for multiple visits. Managers are likely to carry out one or two visits during a typical working day. Subordinate staff, however, is more likely either not to travel, or to make more than two visits during the day. Specialised workers have a high probability to carry out more than two visits during the day, and employees with varying place of work have a high probability of travel in the course of work, a tendency that is stronger as the number of visits increase.

We have also investigated the impact of car subsidy arrangements and parking conditions on the frequency of business trips. Inclusion of these types of variables raises questions of causality. A dummy variable for company car has a strong impact on the frequencies of travel in work. Inclusion of this variable as well as other variables that characterise parking conditions at the workplace also has an impact on the explanatory strength of other variables, especially the employees' position in the firm, that no longer becomes significant.

Age and income of the employees also have an effect on travel frequencies, but the connections are not so clear. Employees in construction, business service, health and social service, generate a little more travel in work than other branches, especially if they are located in so-called R-areas, with low accessibility for all modes of travel. However, a large number of respondents in our sample work in these areas (50 %) and in these branches (20 %), thus the volume of business travel generated by these firms is significant.

Who has the most favourable car arrangements and the best parking conditions?

In PIA (Stangeby 1997) it was found that managers to a greater extent than other employees have an arrangement which subsidise private car use, and that the parking arrangement is more closely related to the location of the workplace. The estimated models confirm these findings, but also indicate that the picture is somewhat more complex.

One very strong result from our model analysis is that the frequency of travel in work also is of great importance for the employees' car arrangements**.** An employee that has a high frequency of travel also has a high probability of having a favourable car arrangement (company car). Our analyses suggest that the car arrangements can be divided into two groups that are somewhat equally distributed between the segments of employees with car arrangements.

The first arrangement includes cars that only can be used during working hours. This type of arrangement is most common amongst workers with moderate income, in private construction businesses and in the public sector. The frequency of travel is, however, of utmost importance for this type of car arrangement. Our estimates indicate that the probability for a worker to have this arrangement may increase by 160 % dependent of the number of visits he has carried out during a working day.

The second car arrangement includes cars that can be used for private purposes, with a varying degree of subsidy for private use. This car arrangement is mainly

confined to managers in the private sector, especially to men with high income, in manufacturing and trade industries. There is a distinction between arrangements that includes free use of the car for private travel and those that do not. The distribution of these two arrangements between the employees is mainly dependent of income, age and gender. This indicates that the most beneficial car arrangements to a certain extent are offered as a fringe benefit. However, the frequency of travel in the course of work also has a high influence on the probability for this type of car arrangement, if not so strong as for the previous one.

Our models confirmed the result from PIA, indicating that the parking conditions are strongly related to the location of the workplaces. Other variables such as, branch and ownership of business, the employees' position in the firm, travel frequency, use of car, and the location of the home, are, however, also important. One very interesting result from our analyses, is that whilst free parking seems equally distributed over the population segments that work in areas classified as B-, C-, and R-areas, this is not the case in the A-areas. Our analyses indicate that employees in manufacturing, education and health-, social- and other personal service, are more likely to have access to free parking than employees in other sectors and branches. Even in A-areas (the most central areas of Oslo) the probability of having access to free parking is high. The segment, which is least likely to have access to free parking, has more than 50 % probability for this, according to our calculations. Employees in government administration are most likely to not have parking possibilities at all.

Car arrangements and parking conditions are of utmost importance for the choice of mode for commuting

Car arrangements and parking conditions play an important part in the mode choice for travel to work as well as in business travel. In our model of mode choice to work the implicit value of travel time is calculated to NOK 70 for travel by car. This value is 80 % higher than the value for travel time with public transport. The value of easy access to a parking space is estimated to NOK 70 per day. If the parking is free as well, the value adds up to a total of NOK 120. This amount is slightly lower than the cost of 8-9 hours of parking in a central private parking house. On the other side we have isolated a "disutility" connected to going by car to the central A-areas in Oslo of NOK 50. Since close to 60 % of the respondents in our survey has free and reliable parking, and only 24 % of them work in the central areas of the city, a high share of the employees in the area have very strong incentives for driving their car to work.

This is confirmed by the calculations conducted with the mode choice model. One of the main results from this indicates that population segments with the strongest incentives for the use of car is "glued to the car", regardless of what we do with the travel times and costs for both private and public transport. Free and reliable parking is a particular important factor in this picture. Our calculations indicate that the probability of choosing car to work can vary by up to 50 % between segments that represents extreme points regarding to parking, and otherwise has the same characteristics.

Public transports for business travel?

The choice of mode for business travel is strongly correlated with the choice of mode to work. Daily use of car in work increases on the other hand the probability of choosing car to work. Car arrangements and parking conditions is important factors for the mode choice both to work and in business travel as well as travel times and travel costs. In our model analysis we have investigated the effect of improved and cheaper public transport, and more expensive use of car (tolls). Both these actions are according to a more "optimal" transport policy (Larsen 1997). Our calculations with the mode choice model for business travel, suggests, this will result in more transit demand and less car use for business travel. The effect on mode choice is small in segments that have a company car. Even though the public transport shares still will be low for business travel, there is a potential for more use of public transport, when the transport system is changed in the direction of a more "optimal" transport service.

A small number of employees has an everyday need for car in their work

According to our data 40 % of the employees with driving licence, occasionally uses car in their work. Only 11 % of them use the car every day, and amongst these 83 % have used the car to work. The 11 % of employees' stand for 60 % of the visits conducted in the course of work in the study area. We cannot on the basis of available data find out whether the use of car is absolutely necessary for the visits conducted by these employees. If we assume that the use of car is necessary for most of this travel activity, most of these employees will have to use the car to work. There are problems with too much car use in the peak hours in the Oslo-area today. This problem is, however, connected to the behaviour of other employees that uses the car, that not have to use it in their work, that not have other errands on their way to and from work, and that have other choices available in their commuting.

Young employees in the phase of establishment have a high valuation of travel time savings

In the work with mode choice models for travel to work we segmented the respondents by income, age, and by errands on the way to work. The segmentation revealed that younger employees with low income and errands on their way to work have a significantly higher valuation of travel time savings than their older and more affluent colleagues. This indicates that young employees in the phase of establishment have a tight time schedule, perhaps due to picking up children at the nursery school, shopping, etc. For this segment the effect of tight time schedules seems to counteract the effect of low income in valuation of travel time savings. This is a very interesting result in light of the ongoing discussion on whether to differentiate the current toll rates for the Oslo cordon toll by time of day (peak load pricing) or leave them as they are today. The distribution effect of such a scheme has always been a heavy argument against a toll differentiation. Our analyses suggest that this argument at least is a subject for discussion.

Does car arrangements socialise to more use of the car?

The travel survey does only contain information of the respondent's travel to work, and in the course of work. The recently reported national travel survey (Stangeby 1999) contains information about all travel conducted by approximately 2000 employees in the Oslo-area. The analyses of this data are conclusive when it comes to the frequency of private travel with car by employees with different types of car arrangements. Respondents with company car conduct more of their private journeys with car compared to respondents without any arrangements. They also conduct significantly less travel with other modes of transport, especially public transport. The overall effect of this seems to be that employees with a company car have a lower frequency of private trips than other employees, but almost all their private travel is done by car. This may due to the fact that the marginal cost of using a company car for private trips is virtually zero for the employee.

Business travel in the context of an "optimum" transport policy

There are two policy questions that can be raised with respect to business trips in urban areas:

- Is there any reason to believe that incentives are distorted in a way that promote too many or too few business trips and are incentives correct with respect to mode choice for business trips?
- Does the existence of business trips distort the incentives with respect to mode choice for commuting trips?

The transport in the course of work is mainly conducted between peak hours and the main mode of travel is the car. Since the external congestion cost of car traffic between peaks is low, at least in Oslo, there is no reason to believe that the volume of business travel in these periods should represent major problem from a social point of view. In the peak periods, business trips by car are "underpriced" to the same extent as other trips by car. Consequently the volume of business trips by car may also be "too high" in the peaks. On the other hand, if for example road pricing is introduced, the generalised cost of business trips by car in the peak periods may actually be reduced due to less congestion and high value of time for business trips. Thus it may be premature to claim that there are too many business trips undertaken in peak periods.

A more problematic aspect of business travel is that this phenomenon tends to blur the distinction between "legitimate" car and parking arrangements and arrangements that must be considered as fringe benefits and distorts incentives with respect to car use for commuting or other private purposes.

If we assume that there is no serious biases in the allocation of business travel activities per se, there is still a problem related to "the fringe benefit aspect". A high proportion of employees have favourable car arrangements and free and reliable parking at the work place without any special need to use the car in the course of work.

Our analysis shows that the fringe benefit aspect connected to beneficial *car arrangements* is a minor problem in terms of volume. This is therefore mainly a problem of beneficial taxation. On the other hand, free parking is of great importance, both because of the high valuation of free and reliable parking, and because the proportion of employees with such parking conditions is very high. With reference to social efficiency we can divide the parking arrangements offered to employees into two groups that give rise to different conclusion in terms of transport policy:

- ✓ Businesses that hire parking place for their employees, or renounces renting out places that could generate income
- ✓ Businesses that uses "spare areas" with little or no alternative value as parking areas for their employees

In the first situation the parking represent a pure subsidy of the employees' commuting. One could argue that the economic benefit from this should be taxed. One reason that this principle is not yet introduced is probably due to the severe problems of delimitation and control it will cause with regard to those that in fact have the need to use the car at work, and therefore also need a parking place.

In the other situation parking space is simply not a scarce resource, but can be characterised as more or less sensible utilisation of land. In this case free parking therefore can not be viewed as a pure subsidy. Policies to reduce the amount of this type of parking therefore have to be founded in an idea of "second best" policy. If we are unable to put an appropriate price on commuting by care, a second best option can be to tax-free parking at the workplace. But also in this case we will have the problem of delimitation and control.