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Summary:

Tendering and organising incentive contracts for public transport in Telemark county

TOI has developed a proposal for new contract arrangements for public transport in Telemark county. These contracts are so called output based subsidy contracts, where the authority pays subsidies according to the number of passengers and the level of the service offered. Based on a simulation model, socially optimal incentives are calculated. The general idea is that these incentives will stimulate the operators to develop more market efficient and welfare optimal service levels. To achieve increased efficiency, however, the operator must be given freedom to adapt to the incentives and the authorities must find a way to select the most innovative operator for these contracts. The report recommends a framework for such a subsidy regime and a tendering regime for these contracts in the city region of Grenland.. The report discuss different alternatives and propose a fremework for such tendering.

The incentive contract model which we have developed seeks to internalise the external effects into the operators commercial decision criteria, and thus to stimulate to a socially optimal level of service. In particular, the benefit to existing passengers and the cost of congestion is internalised into the operator's commercial decision criteria. Allocative efficiency should also reflect the facts that public funds have a resource cost and alternative use and hence a shadow price. This is also included in our model.

The simulation model

TOI has previously developed a simulation model for public transport, which has been applied to local public transport in several Norwegian urban areas (see e.g. Johansen and Norheim (1999 and 2000), Carlquist et al (1999) and Larsen (1993)). Its base principles are documented in Johansen et al (2001). We have further developed this simulation model in order to make it suitable for both in urban and rural areas of Telemark.

The model is based on and simulates the behaviour by a profit-maximizing operator. However, within the model, we have internalised different external effects. In particular, the benefit from existing passengers is included as well as additional costs and benefits related to transfer of car traffic. Furthermore, the model allows for inclusion of additional constraints related to capacity, fares, total amount of subsidies and minimum levels of service. This is important to make the model more credible.

The model calculates changes from a reference point. Thus the model estimates the *changes* in net social surplus rather than the overall social surplus. Formally, it is a matter of non-linear programming with non-linear constraints. Within the model, changes in net social surplus (NSS) comprises of:

1. Change in profits (producer surplus);
2. Change in passengers benefit (consumer surplus);
3. Changes in environmental and congestion costs (externalities), and
4. Resource cost (shadow price) of public funds.

The model considers three "periods" of demand: (i) Demand in peak periods at sections of the route where the capacity is at its limit (Design capacity demand); (ii) Other peak-period demand; and (iii) Off-peak demand. Further, service levels are separated into two distinct categories: a base service level which runs throughout the operating hours, and the additional peak services that add to the basic services during peak periods.

A full NSS maximisation means that the model determines social optimal levels of 7 variables. Equally, profit maximization determines the profit maximizing levels of the same variables. The variables determined in the model are:

- Fare levels for the 3 periods of demand
- Vehicle-kilometres produced in basic services and additional peak services
- Capacity provided per kilometre in basic services and additional peak services

The model has thereafter been used to identify a socially optimal subsidy regime. The optimal subsidy regime is the one that makes the profit maximising behaviour by the operator resemble the situation of maximum social

surplus. To make the operator behave optimally, different incentives must be applied. By identifying the socially optimal adjustments first, and then to run the model to simulate a profit maximising operator's behaviour under different incentives, we can adjust the incentives until the profit maximising operator acts in a socially optimal way.

The optimal incentive structure in Telemark

Our model simulation originally developed three different incentive structures; one for Grenland, one for the rural areas and one for the other urban areas of Telemark. However, the simulations show that the result will not be significantly worsened if a common incentive structure for the entire Telemark is applied. To make the structure easy and to cope with the problem of intra regional routes, we recommend one incentive structure for the entire county. This should be based on the following components:

- Subsidy of NOK 6 per kilometer for all production for all operators.
- A subsidy of NOK 12 per passenger. To make this handier, we recommend that this be given as a fixed mark-up on the passenger revenue.

With these incentives the operator, on a commercial basis, will strive towards service levels that to a large degree resemble the social benefit maximising levels.

This system will make the operator gain a large operating surplus, which mainly reflects all the transfers. By charging the operator a “lump sum” fee equal to the operating surplus, for the right to operate under these performance-based subsidies, the net subsidies at the starting point will be more or less equal to the current subsidies paid to any operator.

By having the ”lump-sum” charge defined in the contract over a period of time, this regime gives the operator great discretion to adjust towards the social optimum. Reducing costs can increase profits; hence the regime avoids major problems of X-efficiency. Furthermore, by moving the production in the direction of the welfare maximizing solution, increased performance based subsidies can be achieved; hence allocative efficiency can be achieved.

Safety net

There is a risk that the incentives will motivate the operators to focus their efforts entirely on kilometre production and passenger numbers to the degree that they overlook other important aspects of service quality, like punctuality, cleanliness, information, staff friendliness etc.

We have therefore recommended a bonus/malus arrangement for punctuality in addition to the above arrangement. This should be based on passenger delays, in order to internalise their valuation of changes in punctuality. Furthermore a guarantee should be given to all passengers that they will be transported.

Tendering of a performance based subsidy contract

We have developed a promising expansion of this subsidy. By tendering such a contract, competition can be used to reduce the costs as well as making the operator behave in a more social efficient way. We suggest the right to operate under such a contract is granted to the operator willing to pay the highest fee to operate under this contractual regime. We have developed the framework for such an approach to be used in the Grenland region.