Funding of road construction in Norway – experiences and perspectives.

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Paper presented at the First International Conference on Funding Transportation Infrastructure. Banff, Canada August 2-3, 2006.

ABSTRACT: Since 1934, Norway has made extensive use of toll financing of road infrastructure. Private toll companies have been established as limited liability companies, with the aim to raise funds for road construction. Their position is exclusively limited to funding, because the National Public Roads Directorate (NPRD) is responsible for planning of road investments and operations. NPRD also acts as a principal when it comes to regulation of the private toll companies. The Norwegian Parliament makes the final investment decisions. The construction and maintenance activities are mainly contracted to private enterprises. Public Private Partnerships (PPP) are not common in Norway, but three pilot projects are implemented. It remains to bee seen whether PPP will gain further ground.

Hence, the Norwegian toll road system has a mixture of urban cordon toll rings of various sizes, tolled fjord crossings, tolled motorways and is now assessing the experiences from tolled PPPs. In many projects, the funding is a mixture of private and public capital.

This paper will present and discuss four main topics. First, an overall presentation of the various toll roads will be given. Second, the planning framework and the toll financing regime in Norway is presented. Third, the experiences from a representative selection of projects with respect to users' reaction to toll user charges are summarized. The socio-economic effects of alternative funding schemes are then addressed. As the fourth part, we have also addressed a few properties with PPP contracts.

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1 Toll roads in Norway

A substantial part of Norway's highway funds (25 %) comes from road tolls. These tolls are collected from cordon toll rings around the larger cities and from larger highway projects like fixed fjord links. Figure 1 shows the Norwegian toll projects in the highway network.

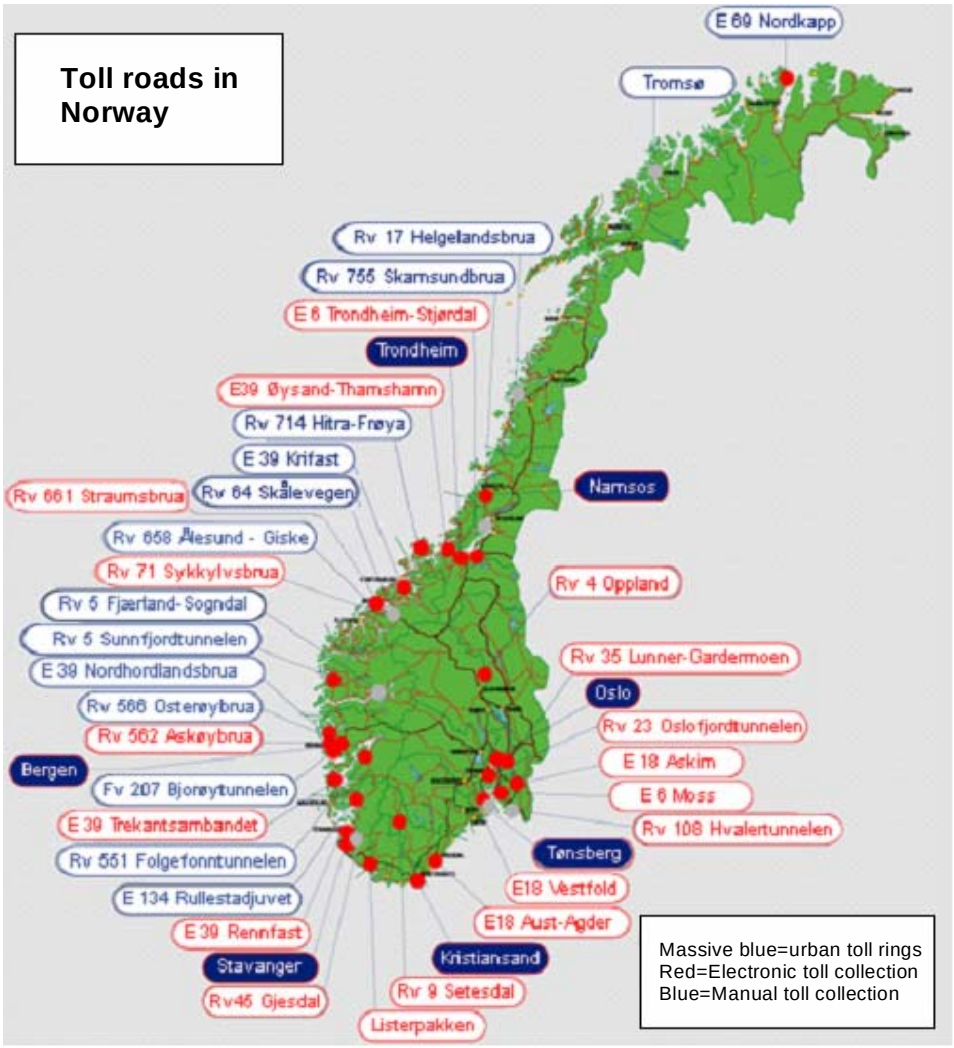

Figure 1 Toll roads in Norway 2004. *Source: Norvegfinans.*

These projects count for 689.1 kilometres of roads (as per January 2003), and there is a further 59.5 kilometres under construction. There are 108 toll stations and a total of 340 toll lanes. Total toll revenue in 2003 was approximately CAD 630 millions. The accumulated investment level in toll roads in 2002 was CAD 665 millions. Table 1 shows the public investment level in Norway for the years 1999-2003.

	1999	2000	2001	2002	2003	2004	2005	2006-2015 (annual average)
Highways	840	840	833	915	863	870	930	913

Table 1 Highway investments (million CAD 2002). *Source: The Norwegian Ministry of Transport and Communications*

Annual expenses for maintenance and operation of the road network to maintain the infrastructure capital amount to approximately 30% above the annual investments.

Total revenues from road user taxes (excluding tolls) were CAD 7.8 billions in 2003, whereof 38 per cent (CAD 3 billions) came from fuel taxes.

2 The framework for road planning and funding

The public sector, represented by the Norwegian Public Roads Administration (NPRA), is responsible for the planning, investments and operation of the national highway system. We will not examine the planning and decision-making process in detail in this paper, but pay attention to a few elements.

The NPRA makes investment plans for the highway system. In Norway, the regional level (the counties) submits priority of projects in the secondary system to the NPRA, as a result of a political process. The NPRA may overrule the regional priority lists, but as a rule they are followed and included in NPRA's road investment plan for each county. The main highway system is NPRA's responsibility, but the counties and municipalities are consulted when issues like land use and environmental issues are affected.

Incentive problems concerning the public and private sector's engagement in road planning are thoroughly discussed in Flyvbjerg et al (2003), particularly when it comes to large and complex projects. This topic will not be pursued in detail here. As mentioned Norway has approximately 45 toll financed projects in operation, and the number is expected to increase. With a few exceptions, the state has not provided any guarantees for the loans, but a system for risk management is established that provides the incentive to give careful estimates on the project's payback ability.

PPP are not commonly used in the highway network. Norway has two pilot projects under construction and a third will soon be launched, under the jurisdiction of NPRA. The following section will deal with the Norwegian system for toll financing and PPP in some depth.

3 Toll financing in Norway

3.1 Policy overview[3]

Norwegian road policy faces major challenges in the years ahead. Increasing maintenance costs for expensive road projects, greater focus on traffic safety together with lacking funds for realizing the political objectives for public transportation (especially in the largest cities), result in less public funds for road construction in the coming years. Along with that, traffic is constantly increasing and hence the need for new roads. The funding problem is not due to scarcity, but to the risk of overheating the Norwegian economy.

[3] Section 3 is indebted to Welde et al (2003).

Facing these challenges, different measures are being suggested. In the largest cities, turning the present toll cordons into congestion pricing schemes is a matter of consideration, even if this is politically complicated. What increases the relevance of congestion pricing is that the Norwegian Parliament has passed an amendment to the road traffic act that allows congestion pricing to be implemented. An important fact is that the toll collection period for the toll cordons of Trondheim and Oslo (the Bergen toll cordon was recently approved for another 10 years) is coming to an end. The alternatives are now either to get rid of the cordons (presumably the most popular choice amongst the motorists), carry on collecting tolls as today or in a slightly different form, or to convert the toll cordons into congestion pricing schemes. Oslo will within a short period of time make a decision on this, and the most probable alternative is a stepwise introduction of a congestion charging scheme combined with an extensive upgrading of the public transport system.

Because of significant traffic growth in recent years, large parts of the national highway system[4] are not suited for the levels of traffic currently experienced. Both this fact, and a need for better traffic safety, indicates that there is a need for an upgrade of the national trunk road system. NPRA has estimated that it will take approximately 30 years to develop the national trunk road system to an adequate standard within today's financial limits. The 'rural bias' in the Norwegian Parliament also makes it less likely that road projects in remoter areas will be sacrificed in order to increase the level of investment in the national trunk road system. In practice, Norway is therefore forced to consider other means of financing which means some kind of private sector involvement. This should be done from a macro economic point of view, to avoid overheating the national economy.

The most obvious alternative is to expand the use of toll financing. Norway, with its long tradition for such financing, has a strong and well-used organisational framework for this. It is now considered to use this tool to improve the national trunk road system. This could however turn out to be politically challenging. The opposition against road tolling is extensive in some areas, and even if road tolling is politically acceptable, the average Norwegian motorist is not in favour of road tolling.

In the present political climate, Public Private Partnership (PPP) therefore appears as an alternative. Norway is currently exploring PPP-financing in three pilot cases and the government is also considering using PPP projects on the rail network. The results of these pilot cases will be carefully evaluated. If one opts to use PPP for future construction of the Norwegian road network a combination of toll financing and PPP is possible.

3.2 The use of tolls

Toll financing has been used in Norway as a supplement to public funding for more than 70 years. The first modern road tolling project was the Vrengen Bridge in the early 1930s. Since then, over 100 toll projects have been realised successfully and only one has been declared as bankrupt.

[4] The Norwegian road network is split between national highways (trunk roads) and secondary roads. National highways link together the different regions and may also be important roads within the region.

Up until the late 1980s, toll financing was mainly used to finance bridges and tunnels. Nearly all the projects were located in rural areas. Since then the number of tolled roads and the amount of tolls paid have increased, and today some 25 percent of the annual funding of road construction comes from toll financing.

The increased use of toll financing is due to a number of factors, but traffic growth has nevertheless increased the needs for road investments. In the largest cities Oslo, Bergen and Trondheim, congestion led to the implementation of toll cordons in the years 1986 to 1991. The legitimacy of these cordons are for funding and not for traffic calming, even if there is a slight difference between peak and off-peak charges.

Today, there are approximately 45 toll projects and the number of projects is increasing. Norwegian motorists used CAD 665 millions on road tolls in 2002, some CAD 275 per vehicle per year.

The revenues from the toll cordons make up the main part of the funds. Smaller projects in the rural parts of the country do however still make up the majority of the projects. The revenues are assigned to the specific project where the tolls are collected. In the coming years, NPRA wants to use road tolls as a strategic measure to upgrade the national trunk road system.

3.3 The organisational framework of Norwegian toll projects

The organisational framework of Norwegian toll projects has remained mainly unchanged since the start. It can be described as a bottom-up approach where local stakeholders are the promoters in most cases. Hence, each toll project is based on a local initiative. This initiative is usually taken by the business community, local authorities or even by individuals. Based on this initiative, a toll company is founded, usually organised as a limited liability company. This company must be jointly owned by local authorities affected by the proposed road project and must be organised as a non-profit enterprise. The toll company acts as an enthusiast and works to establish a political acceptance for the project. This process may take years and often includes lobbyism both locally and nationally. As the company has no source of income, this work will have to be financed through its equity capital. The business community in the area usually contributes with such capital. This is especially common in projects supported by a majority of the local community, especially bridges and tunnels replacing ferry services. When a majority of the local municipalities and the county municipality supports the project, it is being recommended to the NPRA. If the NPRA supports the project (which is usually done if the county is in favour of the project), it is being presented for the Parliament.[5] As all toll projects must be based on both local political consensus and a recommendation from the NPRA, the Parliament will in most cases give its approval.

Even if toll financing involves a strong public complicity through political acceptance and normally a conditional reimbursement for the loans, the toll company has to raise private financing. The conditional reimbursement procedure for reducing financial risk is discussed in Bråthen and Odeck (1998). Private financing takes place both as share capital and, in some cases, as investment capital for the road construction. The shareholders will not get any return on the capital employed. As

[5] This is a simplified presentation of the process leading to a toll project being presented to the Parliament.

the business community often will be heavily affected by toll financing in an area, their attitude towards a project will be normally be greatly emphasised by the political decision makers.

After the Parliament's approval of the project, NPRA has the responsibility for technical and economical feasibility studies. The NPRA is also responsible for the implementation of the project, which is done by means of contractors after a competitive tendering process. The toll company shall only make the necessary funds available for NPRA through loan capital. The company has no formal role in carrying out the project. Even if tolls sometimes are collected before the new road is opened (e.g. on adjacent ferry connections), the basic principle is that the tolls are collected after opening. The loan is usually paid off over a period of 15 years.

The local toll company is responsible for the collection of tolls, but in several cases the toll collection is outsourced to commercial toll collection companies. The toll company remains responsible for the collection and remains the contracting party with the NPRA. The ownership of the road during the collection period remains with the NPRA and the role of the toll company, aside from being a player in the political process ahead, can easily be described as to raise the funds and pay them off. If the economy of the project develops in a favourable way, the toll collection will end faster than planned. The toll company shall be dissolved when the toll collection period is over.

The NPRA has an active role in following up the economy of the toll projects. It shall approve of the tolls and the discount systems and all changes in these systems. Furthermore; each toll company shall compile an annual financial statement on the development of the toll collection. The NPRA leads the development of new technological and organisational solutions for toll collection. This work has lead to the development of technological standards available to anyone who wishes to use them.

3.4 Experiences from Norwegian toll road projects

Even though a large number of Norwegian roads have been fully or partly financed with road tolls during the last decades, the Norwegian way of organizing and implementing toll road projects has been criticised. In a report in 1999 The Office of the Auditor General of Norway pointed out several weaknesses, such as financial management and the organization of the toll companies, and the apportionment of liability between the toll road companies and the authorities. Based on this report, the NPRA proposed changes in the current organisational framework.

There is a project-specific relationship between a toll road project and a toll company, and the company is responsible for the economy in that particular project. This prevents that a good economic situation in one project can cover up a deficit in another, but even so it is not necessarily the most efficient way of collecting tolls. Similarly; higher revenue than expected from an increase in traffic and/or efficient management will lead to an earlier stop in the toll collection and a discontinuation of activities for the company. Conditions like these do not automatically give the right incentives for a more efficient management.

The toll companies act on behalf of the public authorities, and the NPRA often wants to give directions to the companies, for example in designing particular fare structures or with respect to how they should manage the toll collection. However,

since the toll companies are private limited companies, this has often proven difficult. The toll companies have developed an autonomy which in many ways has not been contested. The NPRA has now acknowledged the lack of proper regulation instruments, and also that the existing instruments have not been used sufficiently.

Efficient management and good solutions demands a high level of competence in all parts of the organization. Organizing based on small, limited and time-bonded toll companies makes it difficult to build up, train and retain competent personnel. If toll companies shall continue to be the chosen way of collecting tolls and financing new roads, there should be a change in the way toll road management is organized.

As a result, the NPRA has suggested that a public toll company should handle all toll projects on national trunk roads in the future. This could make it easier to finance extended parts of the roads, as opposed to today when individual and isolated projects lead to great variation in the standard of the road. It is suggested that NPRA can initiate projects on the national highways and that the present requirement for political consensus between the national and regional level will be omitted. It is expected that this arrangement will provide large-scale advantages and therefore more efficient management. Toll projects on secondary roads will still be organized as today. A decision is still to be made on this revision.

One matter of concern has been to what extent the possibility of private financing may influence the decision-making process, with respect to a couple of factors that will be commented upon in turn.

1. Does the possibility of wholly or partly private financing allow socio-economic unprofitable projects to be implemented more easily?
2. Does private financing alter the sequence of project implementations?
3. Are there any distributional consequences of private financing?

Bråthen and Odeck (1998) discuss how the interplay between local and central government combined with the option of private financing may explain why the actual ranking of projects is not in accordance with socio-economic profitability. The main reason why project rankings differ, may be found in the rigid structure of public road financing. A nearly fixed share of public funds has been allocated to each county over a 20 year period, although the *aggregate level* of the public funds has decreased over the last years.

Projects are ranked within each county's investment budget. Especially in rural Norwegian counties there has been scarcity of socio-economic profitable projects. Implicitly, there has been a strong political belief in road infrastructure as a mean for achieving regional balance because a good number of unprofitable projects have been implemented. Another explanation may be that in the period 1994-97 the counties competed for funds granted additional to the ordinary budget. These funds were allocated according to the projects' socio-economic profitability and not from the historical distribution of funds among counties. This situation may have given incentives for the counties to use their profitable projects in this competitive situation and not in the ordinary ranking procedure. A third explanation may be that private financing with a little or no share of public money makes it hard for politicians to resist temptation to show their benevolence towards the desires of a local community.

There has been some concern about to what extent the options of private financing combines with strong local pressure for user payments contribute to locked-up

processes which bind the Ministry and the Parliament in their proposals and decisions. Nyborg and Spangen (1996) have interviewed former representatives in the Parliament's Committee for Transport and Communications. One of the claims was that private financed projects in Norway are often large and complex with a long time span for planning with a lot of work and money involved, and they benefit from articulated local enthusiasm. Thus, such essential features make them difficult to reject. The toll financing options are considered as a particularly favourable factor when the projects are given priority in the decision-making process.

The distributional consequences may be twofold: First, the most apparent one is the effects for lower-income groups that have to use the road system frequently, e.g. younger families driving their children to the kindergarten. Second, if road financing is extensively used in urban areas and not used for regulatory reasons (e.g. congestion pricing), it may be considered as an extra tax for the urban population to release public funds for road building in rural areas. This may however be a rational tax object, if the demand elasticity of urban road use is low, although the "fairness criterion" may not be satisfied.

4 The efficiency of toll financing I: price elasticities

There are many empirical studies that have dealt with price elasticities of various transport modes. Perhaps the most comprehensive surveys among them are those undertaken by Oum et al.(1992), Goodwin et al. (1992), Cervero(1990) and TRACE (1998). Some of the most recent studies include Graham and Glaister (2004) and Goodwin, Dargay and Hanly (2004).

Although this literature is extensive, only a few have dealt directly with toll elasticities. From the few that exist there is a general consensus that the transport demand with respect to tolls is fairly inelastic. Rather than going into details on those that have dealt with tolls, Table 2 summarises them giving the derived values.

Source	Year	Context	Elasticity
Weustefield and Regan	1981	16 toll facilities in the US	-0.03 to -0.31
Weustefield and Regan	1981	15 toll bridges	-0.15 to -0.31
White	1984	Bridges in Southampton, UK	-0.14 to -0.29
Goodwin	1988	Literature review	Average value at -0.45
Ribas, Raymond and Matas	1988	3 intercity motorways in Spain	-0.15 to -0.48
Jones and Hervik	1992	Toll ring in Oslo and toll road schemes in Ålesund	Oslo: -0.22, Ålesund: - 0.45
Harvey	1994	Golden Gate Bridge, San Fransisco Bay Bridge and Everett Turnpike in New Hampshire	Bridges: -0.05 to -0.15 Roads: -0.10
Wilbur Smith and Associated	1995	Numerous US Facilities	-0.1 to -0.35
Hirshman et al.	1995	6 bridges and 2 tunnels in NY City area	-0.09 to -0.50 (average: -0.25)
Mauchan and Bonsall	1995	A simulated model of motorway charging in West Yorkshire, UK	-0.25
Gifford and Talkington	1996	Golden Gate Bridge, USA	-0.15
INRETS	1997	French motorways for trips longer than 100 kilometres	-0.22 to -0.35
UTM	2000	New Jersey Turnpikes, USA	-0.20
Burris, Cain and Penyla	2001	Lee County, FL, USA	-0.03 to -0.36
Odeck and Kjerkreit	2002	A trunk road near Oslo (E-16 Sollihøgda)	-0.5 to -0.8
Matas and Raymond	2002	Panel data of 72 road sections in Spain	-0.21 to -0.83
Burris	2003	Lee County variable pricing project, FL, USA	-0.02 to -1.0

Table 2 Previous studies of easticity of travel demand with respect to tolls *(adapted from Odeck and Bråthen 2005)*

An increase in the toll rate results in a decrease in traffic. Further we note that most of the studies have given values above –0.5 implying that a 1 % increase in tolls will result in a 0.5% reduction in traffic, or less. The variation observed in these elasticities may be explained by different factors such as trip purpose, frequency of trips, the toll level, and the existence of a toll-free alternative and length of trip (see for instance, Wuestefield and Regan 1989). Hirschman et al. (1995), observed that demand is more sensitive to those road infrastructures with good untolled alternatives. Much of this literature deals with situation when tolls are implemented or toll rates are increased. Little empirical evidence regarding elasticities when tolls are removed is available from international studies.

Table 3 summarises Norwegian elasticities in toll road projects.

	Year of toll start/end	Status of toll when calculating elasticity	Toll fees in NOK (2003), cars including driver	Elasticity
Rural roads				
Rv64 Atlanterhavsveien	1999	Removed	50	-2.26
Rv546 Austevoll/Husavik	1991	Removed	4	-0.52
Rv94 Kvalsundbrua	1990	Removed	19	-0.26
E10 Gimsøystraumen	1990	Removed	22	-0.21
Rv60 Aure-Aursnes	1987	Removed	5	-0.03
Rv63 Gravanesvegen	1987	Removed	17	-0.36
Rv457 Flekkerøytunnelen	1998	Removed	32	-1.08
Leirfjorden	2001	Removed	40	-1.19
				-0.74 (average)
Trunk roads				
E16 Skaret-Vik	1999	Removed	12	-0.50
E39 Bokn	1999	Removed	53	-0.75
E6 Mjøsbrua	1996	Removed	15	-0.24
E39 Molde-Vestnes	1993	Removed	11	-0.61
Rv659 Ålesund tunnels	1987	In operation	55	-0.14
Rv64 Fannefjord tunnel	1991	In operation	55	-0.49
E39 Krifast	1992	In operation	63	-0.11
Rv562 Askøy bridge	1992	In operation	50	-0.43
Rv17 Helgeland bridge	1991	In operation	82	-0.78
				-0.45 (average)
Urban motorways				
E6 Østfold (Moss)	2002	In operation	15	-0.48
E-18 Østfold (Askim)	2002	In operation	15	-0.46
E18 Lier (Drammen)	2002	Removed	15	-0.40
				-0.45 (average)
				-0.56 (Grand average)

Table 3 Norwegian elasticities in toll road projects
(adapted from Odeck and Bråthen 2005)

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The grand average of the Norwegian short run toll elasticities is –0.56. Compared to previous studies such as those shown in Table 1 with a grand average at about –0.5, this grand average is somewhat higher. This may be due to "outlier projects" included in our sample. An example is the Rv 64 Atlanterhavsveien. This project had relatively high toll fees while the traffic was composed of a relatively high percentage of leisure trips, which generally are assumed to be price elastic. Elasticity for this project is high at –2.26. Project Leirfjorden and Flekkefjord belong to the same category of projects and they both have relatively high elasticities as compared to the rest. The interval for short run elasticities is at [-2.26, -0.03] and the median is -0.47.

To investigate further how elasticity may vary according characteristics of projects, we looked at the elasticities categorised according to road type. In the table we have

divided the elasticities into three different road categories: rural roads (low volume trunk roads), trunk roads and urban motorways. The averages differ between these groups. We also note that the elasticities of motorways are stable and concentrated around –0.40 to –0.48. Rural roads have the largest spread from –0.03 to –2.26 and hence have higher average. Although there are tendencies of differences in the level of elasticity between road types, our observation set is too small to allow for a sound statistical test of differences by means of e.g. median or Kruskall-Wallis test.

Another issue worth investigating is the extent to which the levels of tolls affect the magnitude of elasticity. The answer may seem plausible; the elasticity will increase with the toll level. As mentioned above, travellers do not consider tolls alone when deciding to travel. They consider the generalised cost of which tolls is only a part of it. Thus it is not given that higher tolls necessarily imply higher elasticities.

Finally, for Norway these results offer some new valuable knowledge. One of the problems frequently faced when evaluating the economic profitability of tolled roads, is the magnitude of the expected traffic volume and the level of traffic deterrence, especially in the short run. The results derived here give an indication of the levels of short run elasticities for Norway in conformity with previous international studies, for use in evaluations. Further, the results offer a starting point which can be developed further to include even more case studies given the growing number of toll projects.

Differences with respect to toll collection efficiency exist. The operating charges' part of the revenue varies from 5 percent to more than 35 percent, and the collection cost per trip fluctuates from CAD 0.21 to CAD 6.22. These observations illustrate that there may be undesirable differences, even if some of the differences have to do with scale effects.

5 The efficiency of toll financing II: Costs of tolling and costs of public funding

The choice of private versus public funding raises questions about the costs of funds. The demand function of the actual project constitutes the basis for calculating the efficiency loss if prices exceed marginal costs. Efficiency loss occurs when consumers with WTP $\geq$ MC are not served. The allocation loss together with the costs of running the toll collection system constitutes the real costs of private funding. Figure 2 shows the allocation loss from toll financing (Bråthen 2001).

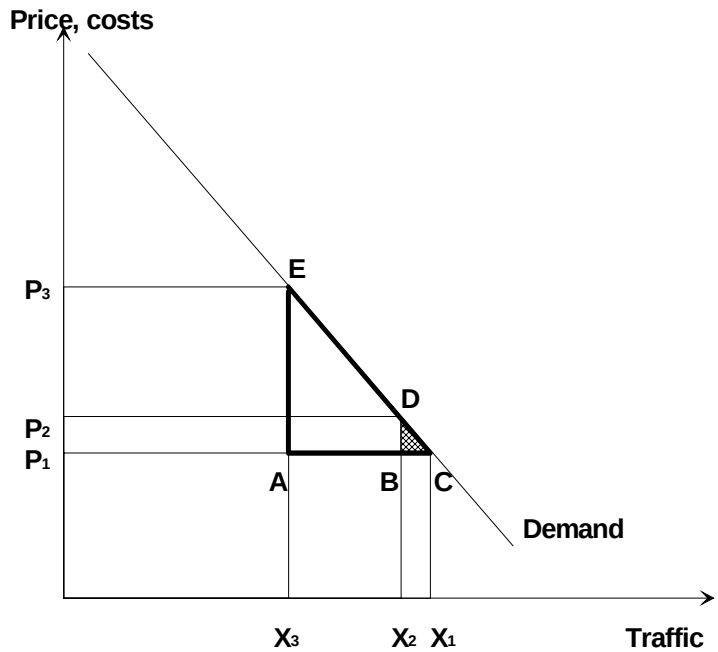

Figure 2 Allocation loss when price>MC

Price P_1 denotes the price level that equals marginal costs. Here, P_1 can be taken to represent the generalised travel costs, with full economic cost coverage[6]. First, a situation can be considered where the tolls are set at a high level. This can be necessary for two reasons, namely to cover a large share of the investment costs and to compensate for a relatively modest traffic volume (as often is the case in fjord crossings). A higher price P_3 then entails traffic deterrence X_1-X_3 and the allocation loss is equal to

$$A_t = \frac{(P_3 - P_1)(X_3 - X_1)}{2}$$

A_t corresponds to the area AEC in Figure 2. If the tolls are set at the lower level P_2 then the allocation loss is reduced to the hatched area BDC. A lower level of tolls can be set when a larger traffic volume makes high tolls unnecessary or the toll financing constitute a minor share of the total investment costs. The elasticity of demand and the design of the discount system are elements that should be considered in order to minimise the allocation costs.

The toll collection costs and the allocation cost should be compared to the cost of public funding, which occurs because public money has to be collected through excises and taxes imposed on other sectors. This causes a situation where the consumers in other sectors face prices exceeding marginal costs. Figure 3 illustrates the principles behind costs of public funds.

[6] All the economic costs of road usage are internalised.

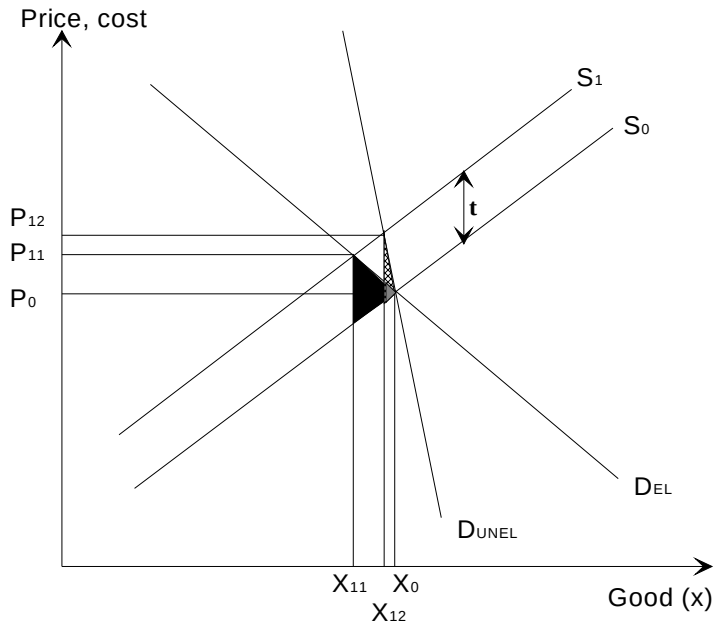

Figure 3 Allocation loss from taxation

A tax *t* is imposed, shifting the supply curve from S_0 to S_1. In a case with elastic demand D_{EL}, the price rises from P_0 to P_{11}. The deterrence effect is given by X_0 - X_{11}, and the black+grey area constitutes the allocation loss. If the demand is less elastic (D_{UNEL}), then the price rises from P_0 to $P_{12,}$ and the deterrence effect is given by X_0 - X_{12}. The allocation loss is significantly reduced (the grey+hatced area). It is thus apparent that the markets that are chosen for taxation should have inelastic properties.

The level of allocation costs has been subject to extensive research. Vennemo (1991) has estimated a cost of public funds to between 80 and 90% of the public expenditure if increased income tax is used, and between 35 and 40% if increased VAT is used to cover increased public expenses. According to these results, one monetary unit used in public funding, costs between 1.35 and 1.8. There are other studies giving lower costs. The Norwegian Standing Advisory Committee on Cost-benefit Analysis recommends a cost of public funds of 1.2 (NOU 1997:27 1997).

In the selection of financing regime, these costs of public funding should be compared with the allocation loss and the collection costs that go with private toll financing. A simple model for doing this, based on estimated demand elasticities in the transport markets, has been made. This model also makes it possible to take the scheduling of the infrastructure investment into consideration with respect to the choice of financing regime. One common problem has been to assess the economic effects of postponements in public investment because of scarce funding, and to compare with toll financing which allows much faster implementation of e.g. fjord crossings or urban arterial road systems. In brief, the model results indicate that given a reasonable level of traffic, private financing (with traffic deterrence costs and toll collection costs) is not dramatically different from public funding (given a cost of public funds of 20 %) when it comes to overall economic efficiency. These results

supports the view that road infrastructure, especially in urban areas and on trunk roads, may as well be subjected to toll financing.

6 PPP - opportunities and experiences

In the 1970s, a drop in public budgets and an increased need for new investments led to a search for alternative means of financing in most countries. In many countries this made way for private sector involvement, through outsourcing or privatisation. Methods of private financing, building and management of public infrastructure made their break-through in the 1990s.

PPP describes different ways of public-private co-operations for development of different types of infrastructure. This implies that a private consortium builds, maintains and operates a specific road project. The payment consists of public funding, tolls or shadow tolls. A combination of public funding and road tolls is the usual payment. A shadow toll means that the company gets paid according to the number of passing vehicles.

A characteristic of PPP is that the financial risk is transferred from the public authorities to a private consortium for a period of 20 to 30 years. The consortium can get the ownership in this period, which will subsequently be transferred to the authorities. This means that the authority's part in a PPP-project is limited to making the order, land acquisition and to supervise how the project should be carried out. Usually, the authorities take the political risk and possibly also the income risk. These elements are parts of the systematic (macroeconomic) risk inherent in the project, which means that these risk elements are beyond the contractors' control.

PPP – advantages and disadvantages

PPP is considered to have two main advantages compared to traditional project financing:

- Value for money/increased efficiency
- Relieving public budgets

PPP can contribute to increased efficiency in several parts of the implementation process and thus deliver a project with the same quality as under conventional procurement for less money, or deliver a project with a superior quality for the same amount of money. Efficiency gains are linked to several aspects of the project.

One of the main reasons why PPP came into existence was cost overruns in public road construction and the fact that many projects were not being completed in time. In Norway, a study of the years 1992-1995 showed a mean cost overrun of 7,9 percent ranging from -59 to +183 percent. By giving a private consortium the responsibility for both financing and the carrying out of a project, this may lead to better incentives for a fast delivery of the project than under traditional procurement. The revenues of the private consortium are based on the completion of the project. The costs of a lengthy construction process will be highly visible through the interest rates. In order to generate revenue as soon as possible, the consortium must focus on a fast and cost-efficient construction process.

Public funding can be unpredictable as it is affected by the political process. A private consortium can arrange for an ideal supply of capital in correlation with a

rational construction design. One of the reasons why public lead projects have experienced cost overruns is alteration of the project design during the construction, often as a result of political interference. With PPP, a significant amount of responsibility will be transferred to the private sector. The authorities will be forced to specify the contents of the contract with respect to both the infrastructure and the quality, before the tendering process. On the other hand, PPP may imply reduced flexibility with respect to the possibility of making benefits from e.g. technical innovations and additional information on e.g. environmental issues.

In traditional projects, building and maintenance operations will normally be separated into two different contracts. This implies that the one responsible for the maintenance will have no opportunity to influence the design of the road. On the contrary, PPP is based on the same entity being responsible for both the construction and the maintenance. The revenues are based on the consortium complying with a certain level of service and hence having few incentives to reduce the level of service provided. The consortium must consider which technical solutions that will give the lowest life time costs. This contractual structure will reduce incentives to overrun costs or to choose an inefficient technology, since the operator's future revenue depends on a flow of suitable quality services.

Several aspects of PPP can however lead to higher total costs than traditional projects and thus giving poor value for money. PPP projects are extensive and the transaction costs will normally be higher than under traditional procurement. Furthermore, the private consortium will need to raise a loan to finance the entire construction and pay off this loan over a longer period. A private consortium will need to calculate a risk premium in the estimated price of the contract. This could in term prove to be more expensive for the public authorities. Compared to public funding discounted over a short period, the PPP model could imply higher total costs unless the advantages of PPP outweigh the disadvantages. This remains to be seen.

The length PPP-contracts will normally be between 20 and 30 years. This means that there so far have been few, if any, opportunities to evaluate the projects at the end of the contract period. In Great Britain five projects have been evaluated by the Institute for Public Policy Research at the signing of the contract (Aas 2003). The savings compared to traditional projects varied from a gain of around 30 per cent to a loss of around 20 percent. However, the conclusion was that the gains were uncertain and it was too early to conclude whether PPP will give added value as compared to traditional projects.

There are a number of circumstances that may affect the functionality of the PPP contracts. First, total contract costs may increase in the future as a result of strategic behaviour. One thinkable example may be that the contractor attempts to replace investment costs with future more expensive maintenance costs. Maintenance costs (e.g. replacement of vital technical equipment) can often not be neglected, and the authorities may thus be forced to renegotiate the contract. Another uncertainty is connected to the stability of the private contractors under long-term contracts. Bankruptcy, merging/acquisition and flagging-out are factors that may cause regulatory problems.

Large and extensive PPP projects demands a competent organisation and a solid financial basis. When a private company enters a tendering process, it has to consider the possibilities for not being granted the concession and have no options for covering the tendering costs. Because of these uncertainties and also the size of the

Norwegian contractor market (the barriers to entry are presumably higher for foreign companies), the number of bidders may be limited, thus reducing the competitiveness. Regardless of the number of bidders, PPP in itself can lead to reduced competition, since the company who gets the contract will basically have a monopoly during the contract period, which may give incentives to a demand for contract renegotiations particularly if the revenue side develops adversely e.g. because of an economic downturn. The authorities are bound by the contract, and will hardly profit by efficiency gains unless the contract is designed for splitting the benefits between the operator and the authorities. It is presumably very important for PPP success that the authorities gains deep competence as a buyer of these services, and that the contracts are designed with the necessary flexibility and the right incentives.

As for toll financing, PPP will contribute to relieve public budgets. This is important for countries with limited resources or for countries like Norway who has the funds available but with little possibilities of increasing the public budgets since the economy is close to the limit of capacity. A discharge of public budgets will also release capital to other purposes than transportation. On the other hand, extensive use of PPP-financing will commit future Parliaments economically and hence reduce future degrees of freedom with respect to policy design. In Norway, the three pilot PPP projects are expected to bind about 10 percent of the road investment budget for the years 2006-2012. An increase in the number of PPP projects today can therefore add power to today's Parliament on expense of future Parliaments.

7 Conclusions

This paper has presented some evidence and conclusions with respect to toll road financing in Norway. Such financing is quite widely used. Rather sophisticated regimes for planning and toll collection are implemented. Evidence shows that toll collection may be implemented without losing economic efficiency as compared to public financing. Toll financing may be used as a measure to reduce pressure on public budgets and to avoid overheating of small, open national economies. However, good planning regimes and risk assessment procedures are necessary to avoid adverse effects e.g. related to project quality and costs.

Private-public partnerships (PPP) are currently used in a few trial projects to attract private companies to engage in road construction and road maintenance. The experiences from these trial projects are not available yet. The paper discusses a few advantages and disadvantages with PPP, where one main disadvantage is that regulatory problems may emerge because the private firms responsible for the road constructions are given long run contracts (25 years maintenance contracts) and thus will be given monopoly power.

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