

## Report on Workshop #3: Infrastructure Policy for Roads and Railways

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#### 1. Introduction

In looking at economic policy in respect of transport infrastructure (taken to be fixed-route track, terminals, and other fixed capital investment but excluding vehicles), members of the workshop brought to the discussion a considerable sympathy for the involvement of private capital but recognized that significant difficulties can arise in the application of market forces in this field.

Given the focus of the conference on *surface* passenger transport, together with the absence of any workshop papers on marine transport, the workshop directed its attention to road and rail infrastructure but noted that existing practices in other modes (notably in respect of access to airport runways) help to cast light on road and rail issues.

In developed countries, at least, a road or rail link usually is part of a network of such links. In general, there are important interdependencies between links, and these must be recognized in the design of contract arrangements for private participation in the provision of infrastructure services. In most cases, *existing* road and rail networks have been created at public expense and are controlled by government agencies. Even where ownership of such networks does not pass to the private sector, 'commercial' arrangements may be made for control and management either by public-sector corporatization or by private-company participation. Whatever the arrangements, interdependence between links affects (or should affect) the setting of prices for access to the various links.

Furthermore, if new links are to be added to the network, private funding can result in fragmentation of ownership. The determination of access prices then also affects the distribution of revenues to the several beneficial owners. Furthermore, network interdependence gives private owners an incentive to seek influence over what other links are to be built or not built.

Besides such network interdependence issues, there can be difficulties in allocating the capacity of an individual link whenever more than one vehicle-operator is to be allowed access. In the case of roads, the major issue — perhaps the only significant issue — is that of congestion. In the case of railways, the operation of passenger (and freight) trains presents further problems: because of indivisibilities, there is a need to define and allocate train paths, a task that is analogous to, but more complicated than, the assignment of aircraft movement slots for airport runways.

These issues have to be borne in mind when designing contracts for private participation in the provision and operation of infrastructure. In particular, they can have significant influence on the assignment of commercial risks as will be shown later in this report.

#### 2. Papers Received by the Workshop

Chris Nash and John Preston: *Competition in Rail Transport: A New Opportunity for Railways*

After reviewing certain aspects of the present condition of railways in Europe, this paper examines privatization proposals, with particular reference to the UK government's intention to separate track provision from train operation and to invite private-company bidding for the latter.

Jan-Eric Nilsson: *Regulatory Reform in Swedish Railways*

After a review of the 1988 policy that separated track provision and train operation, the paper examines current proposals to introduce competition between train operators and looks particularly at problems that arise in the allocation of train paths to rival companies.

Gordon Mills: *Privately-owned Toll Roads: How Profit and Welfare Effects Can Have Opposite Signs*

Reviews some recent schemes in New South Wales and elsewhere and examines the many potential sources of divergence between private profit and public welfare in the case of (a) a single road link, and (b) a link which is part of a network in which there is demand interdependence between links.

Sylvie Thibaud and Patrick Bonnel: *Methods for the Evaluation of Urban Fixed-track Public Transport*

In France, such *ex post* evaluation of new infrastructure is required by law. The paper reviews the evaluation objectives and the alternative methods employed; it puts emphasis on the 'congruence' concept, which recognizes (1) that the creation of new urban transport infrastructure is often only a part of a wider policy for changes in urban form, and (2) that the consequences are usually widely disseminated and often difficult to identify and measure.

Richard M. Soberman: *High Speed Trains for Canada: Technological Excellence, Groundless Conviction or Bureaucratic Obsession?* (Unfortunately, Soberman's paper was not available for publication.)

Offers a skeptical view of the prospects for investment in high speed trains in Canada, concludes that government funding is unlikely, and notes that private firms have not so far shown interest even in funding a thorough feasibility study.

In addition:

- a written paper was received on recent transport policy developments in the state of Victoria, Australia; its author Bernie Carolan was unable to be present, but Stewart Joy spoke to the paper (see below)
- John Bonsall gave a very interesting presentation on bus transit in Ottawa.

### 3. Organization of the Workshop

The participants

- noted that nearly all the papers dealt directly with infrastructure issues, and that there were many points of contact *between* the papers
- agreed that each paper should be presented briefly in no more than 15 minutes
- agreed to devote the rest of the workshop time to brainstorming to be addressed to two tasks:
  - (1) identification of the issues that need to be resolved if there is to be private participation in the provision and operation of transport infrastructure
  - (2) identification of the principal policy alternatives for each decision, together with some discussion of the advantages and disadvantages of the alternatives.

It was also noted that the material in the papers could be used to illustrate this general analysis.

Incidentally, the workshop implicitly took it for granted that there can be shortcomings in public-sector provision and did not discuss in a systematic way the nature of these shortcomings nor the contexts in which they can arise. As pointed out later by Jan-Eric Nilsson, there is also an important task in building up a detailed picture of such matters.

Besides the authors of the papers, several other conference members participated in the discussions; there were especially important contributions from Ken Gwilliam and David Hensher.

The balance of this account reports on the discussions. Although there seemed to be widespread agreement on many matters, no attempt was made to reach a consensus. Accordingly, individual members of the workshop should not be deemed to agree with all (or any!) of the views expressed.

#### **4. Proposals for Construction of New Infrastructure**

The task of preparing and evaluating proposals for new infrastructure may be thought of as comprising several discrete but inter-related steps. These are identified here; and each is discussed in a manner that places emphasis on the potential for participation by private companies.

##### *Initiation*

The proposal may have its origin in government or in a private company. It may be for a particular infrastructure scheme, whose selection reflects at least an implicit view about a desirable choice of transport mode. This is particularly likely if the proposal comes from a private company. Such a project-based approach may be sub-optimal; this is considered in the discussion of the next step.

##### *Assessment: structuring the alternatives*

Public-interest assessment is necessarily a role of government though, of course, the assessment task may be contracted out. The process of assessment must go back to the fundamentals of the situation: what is the transport need? in an urban context (especially), is transport investment to be accompanied by other actions which will alter that need? what are the likely consequences for urban form of any provision of new transport infrastructure?

To address these issues, the assessment process may need to specify a program for change, rather than an individual project, and must certainly review a wide range of alternative policies (which may involve alternative transport modes). If the assessment has been stimulated by a proposal for a specific project no matter whether that proposal has come from a private company or a government agency, it is necessary to take a wider view before committing to a particular project.

Soberman's workshop paper reports a recent Canadian case that illustrates the point. It notes that two alternative high-speed train proposals came from the respective private-company train manufacturers and argues that (even within the context of high-speed trains) the government task force did not undertake in-depth study of an adequate range of alternatives; an important omission was the option of undertaking relatively modest upgrading of existing track and introducing electric traction to achieve speeds that are higher than the present service but not very high.

Where a project proposed by a private company is ultimately adopted (perhaps with modification), it may be desirable for government to conduct a bidding competition to determine who builds. In that case,

government should compensate the initial proponent for use of intellectual property; Nash reported that failure to do this has been a big problem for the British government's attempts at private infrastructure development.

*Assessment: criteria*

In assessing its willingness to participate, a private company naturally looks at profit prospects; the calculation of these takes into account any government subsidy or other financial assistance.

In contrast, a government should take a much broader view; in principle, a cost-benefit analysis should recognize user benefits (whether or not converted into project revenue) and also external costs and benefits. The workshop paper by Thibaud and Bonnel emphasizes the potential complexity of *ex post* assessment; and, of course, this is no less in the case of *ex ante* appraisal. The proposed infrastructure may be part of a package of policy initiatives. The effects, for example, in terms of changed travel patterns may depend on the socio-economic structure of the pertinent (urban) areas, and this may change over time.

At the other extreme, when the policy scope is relatively confined (e.g. provision of high-speed rail service), Soberman's paper illustrates how a quick, approximate calculation can provide a useful approach to generation of alternative schemes and to preliminary sifting among them.

The distinct criteria of public interest and private profit may favor differing project characteristics; for example, taxation rules may encourage a private company to seek a longer contract in a BOOT (build, own, operate, and transfer) arrangement than would be preferred on public-interest grounds.

*Making a decision*

The decision-maker necessarily is the government. But the form of the decision depends on whether private participation is wanted. Specifically, the government may take either of two kinds of (affirmative) decision:

- an 'active' decision, i.e., a decision that the government will undertake the project itself
- a 'permissive' decision, i.e., a decision by government that it will allow the project to be undertaken by a private company

In the latter case, the government-sanctioned project may be initiated by a private company or it may be one that is defined by government following its own cost-benefit or other analysis.

In the absence of any role for private participation, there can be either of two kinds of shortcoming. By virtue of defective analysis (or a failure to accept the results of a good analysis), government can undertake a project that is not regarded as being in the public interest. Conversely, a project that scores well in a competent cost-benefit analysis may not be undertaken because of lack of funds.

Equally, a *permissive* decision can lead to either of two types of error (cf. a related classification in Kay, Manning and Szymanski, 1989, p. 213). First, the government may seek construction that is in the public interest but is such that private company participation is not forthcoming because of a lack of profitability. (To preclude this outcome, the government may offer a financial subsidy. Of course, in practice, the government may provide subsidy for a project that is not in the public interest!) Secondly, the government may allow private construction of infrastructure that is privately profitable but is not in the public interest. (Mills' workshop paper shows how this might happen in a road network context, where demand

interdependence and network changes can together drive such a wedge between private profit and public welfare.)

This last difficulty demonstrates that government can not rely on the profit motive for project selection. Rather the government *must* undertake its own cost-benefit analysis; and this is a regrettable conclusion, given the institutional difficulties in obtaining, and gaining political acceptance for, a competent and honest cost-benefit analysis.

#### *How to fund construction*

Although choice of a funding mechanism interacts with the decision as to which parties are to take the various risks, there is in principle a distinction between the two dimensions. Looking first only at sources of funds, there are at least five alternatives:

- A Government funding out of tax revenues with no user charges
- B Government funding recouped from user charges but with no private-company participation
- C Private-company funding with no government contributions in money or kind and with reimbursement from user charges
- D Private-company funding with overt or disguised contributions from government
- E Joint venture between government and private interests with the two groups holding one and the same class of equity capital

Mechanism B may be appropriate when the government wishes to retain the revenue risk (see below); but the reluctance of road users to pay road tolls may discourage use of this mechanism. Governments may prefer to shelter behind private-company participation, which allows the government to excuse the imposition of tolls as something needed to reimburse the company.

Mechanism C is the most thorough and 'cleanest' form of privatization. In contrast, Mechanism D can be used to give government financial support to projects that would not otherwise be profitable. Such support might be in kind e.g. a gift to the company of use of the right-of-way. Or it may involve direct financial support including assignment of revenues from existing tolled infrastructure to help pay for the new. The workshop was told that the UK government has, in effect, done this in the case of a new tolled crossing planned for the Severn estuary to supplement the capacity of the existing Severn Bridge; and an arrangement similar to this was used to secure private participation in the construction and operation of the Sydney Harbour Tunnel.

Although such arrangements can make the additional infrastructure privately profitable, there is a particularly strong *a priori* doubt as to whether the extra capacity brings a net welfare gain. Furthermore, in the general application of Mechanism D, there is no guarantee (to say the least) that the arrangement will lead to efficient prices for the use of the infrastructure.

Where Mechanism D involves a loan from government (which may be at zero interest), as in cases in New South Wales, the government's funds may rank behind all other debt of the company, being repayable only after the other has been repaid. In such cases, the government is, in effect, adopting risks which, it might be argued, should rest with the company.

In contrast, Mechanism E which was advanced in the workshop but is not known to have been adopted anywhere so far would give symmetry in risk-taking, with the two parcels of shares ranking equally in the debt structure of the (joint-venture) company. Such an arrangement might be attractive where the private company is willing to share the risk but the project is so large as to make it difficult or impossible for the private interests to raise all the funds. (It also has certain incentive implications, discussed below.)

### *Contract conditions*

In almost all cases of private participation, there will need to be a contract or other form of agreement between government and the private company, if only because (at a minimum) the government will be giving undertakings to provide legislative support. The following list identifies important components present in the contract (where relevant) and offers brief comments.

- 1 *Cost risk:* While large civil engineering works sometimes cost more than budgeted, private companies generally have a better record than government agencies in managing such construction; accordingly, there is much to be said for delegating the construction-cost risk to a private company; this may be done by inviting bids for a fixed price contract to build, perhaps, to a specification determined by the government agency; the contract terms should reward early completion and penalize late completion.
- 2 *Revenue risk:* There are arguments for and against assignment of this risk to a private company. If the risk is wholly assigned, and if the government provides no subsidy whatsoever, then it might be possible for the government to rely entirely on the profit motive for decisions on
  - project selection: in other words, the private company alone would decide whether to build the infrastructure, and what quality and quantity to provide
  - pricing of access (which could however be made subject to economic regulation in a manner suitable for the control of a private company that enjoys market power)
  - availability and maintenance of the infrastructure

Then the hope would be that private decisions would serve well the public interest.

On the other hand, and as already noted, there can be significant divergence between profit and welfare. In particular, if government offers financial assistance to ensure private profitability, then project selection is not being steered by the profit motive. And in that context, there is little or no argument for assigning the revenue risk to the private company. (Good management that ensures availability and other aspects of quality can be secured by a management contract with limited incentives that fall far short of assigning the revenue risk; see below.)

A further argument for government retention of the revenue risk relates to the proposition that the private owner is not well placed to manage risk that arises through demand interdependence with other (actual or potential) links in the network. When revenue risk is assigned to a private company, the company may seek undertakings from government not to build competing links (and, perhaps, to build complementary infrastructure). It may not be in the public interest for government to enter into such long-term commitments. In the absence of such commitments, the government has no direct incentive to protect the financial position of the toll road owner, unless the government itself has a stake in the revenue as would be the case with Mechanism E.

Yet another argument for not assigning all the revenue risk is that overall government transport policies

(for example, on road fuel tax) affect the revenue outcomes, and a private company is unable to manage the risks that flow from such factors.

3 *Contract duration, and extension:* Where a build-own-operate-transfer arrangement is made with a private company, that company will need a lengthy contract for it to secure reimbursement of its initial outlays. The workshop noted (1) that in France, at least one long-term contract for a long-distance toll-road had been extended some time before expiry in a new deal with government under which the company agreed to build additional road, and (2) that in New South Wales, a similar contract revision had been made within two or three years of the signing of the original contract. To the extent that these instances involve use of revenues from existing assets to help fund additional infrastructure, there is (as before) some *a priori* concern that the extra investment may not add to welfare.

4 *Other contractual features:* The workshop briefly noted (but did not discuss) what may be termed 'packaging' issues:

- should the project be fully specified and planning permission and other legislative authorities obtained before private bids are invited? (This is urged, in the case of toll roads, in Fielding and Klein, 1993.)
- where the transport infrastructure brings significant positive externalities (for example, in enhancing land values), what if anything should the government do to assist the private company in value-capture?

### *Construction*

Where the cost risk is assigned to a private company, that company has a financial incentive to manage construction efficiently and may itself appoint a specialist project management company. Even where the cost risk is retained by government, project management should be contracted out to a private company; the contract should have strong incentive features, including penalties for late completion and rewards for early completion.

## **5. The Use of Infrastructure**

After transport infrastructure has been constructed, there remain many difficult issues in relation to how it should be maintained and operated. In particular, it is important (1) to strike an appropriate balance between economy in the organization of maintenance work and availability and quality of infrastructure services offered to users, and (2) to allocate rights of access between rival users in a manner that promotes economic efficiency. These issues must be borne in mind in designing contracts, especially when those contracts make provision for private participation. In the following notes, maintenance, operation, and access are considered in turn, notwithstanding the very complex interaction between them. Throughout the discussion, it is supposed that (some or all) vehicle operation is undertaken by private companies other than the infrastructure owner/operator.

Because of the likely presence of market power in the operation of infrastructure, there seems to be some role for economic regulation. Besides occasional mention in the notes about the specific issues in maintenance, operation, and access, there is a concluding section that gives a systematic review of the potential role for an economic regulator.

### *Maintenance*

Even where government does not assign the revenue risk to a private company, maintenance of infrastructure may be contracted out. In that context, the contract should contain detailed provisions specifying maintenance standards and the timing of routine maintenance (determined in such a manner as to avoid undue interference with vehicle operation). The performance requirements may be subject to *dynamic* benchmarking (so as to recognize developments in technique as experience in management is accumulated over time); and financial incentives should be specified so as to punish failure to reach the specified standards and perhaps to reward extra quality.

Alternatively, if the revenue risk is assigned to a private company, then it may be argued the profit motive will take care of these performance requirements for maintenance. However, the implicit assumption is that the company operates in a competitive market. Recognizing the likely presence of market power (enjoyed by the infrastructure operator at the expense of vehicle operators), there is a case for regulation of standards in much the same way as there is then a case for regulation of access prices. However it must be recognized that the regulator will have difficulty in identifying the socially-optimal standards and may lack incentive to attempt to do so. (In the absence of budgetary pressures, government agencies tend to specify standards that are higher than optimal.)

### *Operation*

'Operation' is thought of as the determination of the specification of physical standards for access (vehicle weights, speed regulation, safety procedures, etc.) as well as day-to-day tasks such as monitoring of infrastructure condition, temporary suspension of entry to parts of the infrastructure, and control of vehicle-movements in general (through signalling or in other ways).

Operation and maintenance may be bundled together in a single contract. Even when this is done, the company winning the contract has to arrange appropriate coordination between the separate but related activities. Thus, even in this case, the contract will need to specify service standards, including availability, and must provide appropriate incentives. As in the case of maintenance, there are problems in identifying socially-optimal physical standards for operation. Again, there may be a role for an economic regulator.

### *Access*

A fundamental issue is who should be allowed to operate vehicles on a transport network. In the case of *roads*, the traditional practice has been one of open access for all who meet physical specifications for vehicles, etc. Coupled with this is a tradition whereby road vehicles are not operated (in passenger or freight transport) by the road owner/operator, not even where the latter is a private company.

This separation of infrastructure provision and vehicle operation has not produced major difficulties, perhaps because the interface between the two activities is not so *very* complex. Nevertheless, there can be frictions: vehicle operators sometimes complain of inadequate maintenance and of the performance of maintenance tasks at inappropriate times or in ways that are otherwise inappropriate. These issues should be addressed by contractual arrangements as already discussed.

In *railway* operation, the interaction between truck and vehicle operation is a good deal more complex, and this may help to explain why most railway organizations (especially those that are owned by governments) themselves operate all the trains that travel on their tracks.

Yet, as noted in Nilsson's workshop paper, the Swedish government introduced an arrangement in 1988



whereby track provision and train operation became the responsibilities of distinct organizations; with limited exceptions, the State Railways continue to have a monopoly of train operation. However, in 1993 the government has been giving consideration to deregulation of train operations; this would allow anyone who is 'fit, willing, and able' to establish train services on the state-owned tracks. By 1995, this *may* result in on-track competition in which two or more private companies offer similar services.

As reported in the workshop paper by Nash and Preston, the British government now proposes to separate track provision from train operation. While the former will presently remain in government ownership, the intention is to invite bids from private companies for train-operating franchises; again, this may result in on-track competition between operators in the case of commercially viable services but not in the case of services that require subsidy from the government.

Nash and Preston see many difficulties with these proposals and fear that in important respects, the new arrangements may serve the public interest less satisfactorily than the present form of semi-integrated operation, in which British Rail operates both track and trains but is structured so as to give separate management groups the distinct responsibilities. Indeed, train operation is itself divided among several groups.

By and large, the workshop accepted that fragmentation of responsibilities may lead to many significant problems, and that (to say the least) a satisfactory outcome would require very detailed and carefully-written contracts with well-considered incentive provisions. In using such an approach to yield efficient interfaces between supplying parties, the major issues to be addressed include these:

- There is much to be said for *not* allowing the track operator also to operate trains. Otherwise, the track operator may favor its own trains at the expense of the operations of rival companies. (This is a standard infrastructure argument which arises also in telecommunications.)
- Nash told the workshop that most potential train operators in Britain seemed unhappy with the prospect of operating on track owned and controlled by another party (even though that track owner would not be allowed to operate trains). At first examination, this fear seems unwarranted since rail companies in the USA do often operate on each other's tracks; on second thoughts, however, this precedent may not reassure, since (1) the potential UK operators will not be operating any track and will lack the knowledge, experience and symmetry of position held by American railroads, and (2) most recent US practice relates to freight trains where the interface problems are likely to be less severe than in the case of the intensive passenger networks which will constitute much of the UK practice.
- Potential train operators in the UK have expressed little enthusiasm for committing themselves to a franchise in circumstances when they do not know how much competing train service will be operated by others. In that case, their bids k capacity may be set at low levels. To avoid this, it may be better to award exclusive franchises. (Even exclusivity is no guarantee that bids will be forthcoming. In responding to questions prompted by Carolan's paper, Joy reported that the government of Victoria had been hard-pressed to find any takers for exclusive rights on certain branch rail lines, and that the limited arrangements now put in place left much of the operating risk with the government.)
- On the other hand, when the time comes to award new franchises, exclusive incumbents in train operation are likely to enjoy major advantages resulting in little competition.
- There are problems for the track-owner in pricing access when given track has more than one use. While price-discrimination according to type of use may be acceptable (and also may be necessary to help cover a large part of track costs), efficiency and equity both require that charges to two different

franchisees serving the same market should be the same.

- There are analogous problems in allocating units of capacity (i.e. train paths) to different train operators. The traditional approach has been one of administrative coordination, effected by a timetabler employed by the track owner. This arrangement does not entirely rule out the application of monetary incentives, which induce the track owner to give high priority to high-value uses. But it does fall far short of a full market-bidding process. In his workshop paper, Nilsson reported on research on the use of computer-assisted markets to determine allocations of train paths. In such methods (which are being explored for the allocation of infrastructure capacity in several network industries see McCabe and others, 1991), rival users submit bids in real-time markets, while the computer algorithm recognizes all the supply interdependencies and determines prices and allocations in a way that maximizes the aggregate benefits. Besides his own work in Stockholm, Nilsson referred in the workshop to railway-market experiments being conducted at Cal Tech under the supervision of Plott.

To sum up: the organization of access to track capacity by train operators competing for that capacity (and possibly competing also for the same final customers) is not a simple matter. Carefully-designed incentive systems and contractual arrangements may result in good allocations, but there is insufficient experience to suggest that good market-based solutions can be found readily. Advocates of privatization of train operation often seem to overlook the difficulties.

Implications for final customers of arrangements for access to track

Where there is open access to road or rail infrastructure, there can be issues of coordination of service offered to the final customers, especially in the case of passenger transport. Having regard to some shortcomings in this area arising from deregulation of bus services in the UK, the workshop briefly considered the risks of similar problems arising in rail services. The issues include:

- difficulties that customers experience in obtaining timetable information for the services of rival companies
- timetable features (especially headways between rival trains) that may be determined on competitive grounds rather than on the basis of maximum overall service benefit
- lack of transferability of tickets between rival-operators, giving less flexibility to customers than in the case of a single train-operator.

These problems arise, of course, because even a well-organized market will be imperfectly competitive.

## 6. A Regulatory Role

Although workshop members were keen to see private-company privatization, there was widespread recognition that provision and operation of transport infrastructure is generally attended by market imperfections, no matter how cleverly designed are the institutional arrangements. In the face of such imperfections, a limited role for an economic regulator may afford the lesser evil.

In designing a regulatory arrangement, it may be appropriate to include the following elements:

- setting of upper limits on the profits from ownership of infrastructure: this may be needed for roads and possibly for some rail lines; perhaps best effected by price capping

- regulation of access and access charges (to ensure equitable treatment of different vehicle types, in the case of roads, and to ensure equity in the treatment of rival train operators): requires conventional application of the principles of competition policy and of allocation of joint costs
- coordination of network activities, including publication of timetables; and oversight of allocation of train paths, ticket transferability, assignment of through revenues between operators
- regulation of intermodal aspects, especially to give effect to government policy on externalities

The aim should be to regulate only to the extent needed to ensure that private-company policies do not diverge to a major extent from those that would secure the public interest. In particular, where appropriate market mechanisms can be devised, the regulator should be a supervisor of those mechanisms rather than a giver of administrative rulings on resource allocation.

The workshop participants were exceptionally cooperative people; thanks to that, we enjoyed an orderly and constructive discussion. While the present report is necessarily only a summary, I hope it does reasonable justice to the quality of that discussion. Special thanks go to David Hensher who took notes on my behalf. I also thank Chris Nash and Jan-Eric Nilsson for comments on a draft of this chairman's report.

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