Investing in Transport Infrastructure: Institutional Design and Efficiency

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ABSTRACT

This paper focuses on the task of designing institutions to promote efficiency in investment in transport infrastructure, such as airports, ports, roads and rail, the building blocks of gateways and corridors. The scope for competition in provision of these facilities is briefly examined, but in many cases it is quite limited. Alternative institutional arrangements include provision by public enterprises, by private but regulated enterprises, and by hybrid forms such as Public Private Partnerships. Australia as extensive experience in all of these arrangements, and the difficulties in achieving adequate but not excessive investment is examined in the light of this experience. Emphasis is given to the problems of optimising investment under private ownership and incentive regulation, and under Public Private Partnerships. Some problems are given particular attention - these include regulatory gaming, the pressures from regional governments for excessive investment and the difficulties in allocating risks and responsibilities between parties. The paper concludes with a discussion of recent trends in investment evaluation, which have seen a growing reliance on inappropriate techniques, which give rise to exaggerated estimates of benefits, which are used to sell projects.

1. INTRODUCTION

This paper is concerned with how new institutional arrangements, such as incentive regulation and Public Private Partnerships (PPPs) influence investment in the transport and communications infrastructure base of gateways and corridors. How well gateways and corridors function, in terms of facilitating the expeditious and safe movement of goods and people at low cost will depend on how well these infrastructure building blocks perform. The performance of this infrastructure is highly dependent on the institutional environment it lies in. The paper will consider general principles, and illustrate them with the Australian experience.

This institutional environment has been changing markedly in a number of countries. A reliance on public provision of infrastructure has been replaced by private provision, subject to incentive based regulation. In addition, new arrangements such as PPPs have been used to enable private provision of facilities, which form part of predominantly publicly owned networks. This institutional environment involves ownership, whether public or private, regulation and the structure it takes,
competition, and tax or subsidy arrangements: these will impact on the performance of firms or industries. Countries have reformed these institutional arrangements, at least in part, to improve the performance of their gateways and corridors. To a degree they have been successful, though there are problems, which remain.

A particular focus of this paper is on investment in infrastructure, to increase capacity, reduce costs and improve quality. Getting investment right, in the sense that it is neither inadequate nor excessive, is an important determinant of infrastructure performance. Inadequate infrastructure gives rise to congestion and delays, and to the costs of unmet demand, while excessive investment will unnecessarily add to costs. Getting investment right is no trivial problem. Some institutional arrangements, such as private firms, which are subject to cost based regulation, have been recognised to have encouraged excessive investment and waste. Newer approaches, such as incentive regulation, are being used for their positive aspects, but they are often regarded as providing too little an incentive for regulated firms to invest.

Several of the approaches to the problem of obtaining efficient levels of investment in the infrastructure, which makes up gateways and corridors, are considered here. In section 2 there is a brief introduction to the options. Private ownership combined with incentive and hybrid regulation is examined in section 3, and the ways in which this regulation can be designed to improve investment performance are considered. The increasingly popular option of PPPs is examined in section 4 - their advantages and disadvantages are considered, along with the ways of designing them better. New trends in investment evaluation are examined in section 5. There is an apparent trend away from rigorous techniques, such as cost benefit analysis towards unreliable techniques, such as impact analysis, which invariably overstate the benefits of projects by a large margin. The implications of this trend are suggested. Finally some conclusions are drawn on the practicality of designing institutional arrangements, which promote efficiency in investment in gateways and corridors, and on the willingness of decision makers to avail themselves of the options on offer.

2. NEW INSTITUTIONAL ARRANGEMENTS AND TRANSPORT INFRASTRUCTURE

In countries like Australia, the United Kingdom, New Zealand and others, much of the transport infrastructure which provides the building blocks of gateways and corridors was provided by government, either directly, by government departments, or by public enterprises. This is in contrast to the United States, and partly, Canada, where there was a much greater reliance on provision by private regulated enterprises. There was a presumption that the government department or enterprise would act in the public interest. To this extent, it would seek to achieve efficiency, in terms of ensuring that capacity was neither excessive nor inadequate, of keeping the cost of building the infrastructure to a minimum, pricing efficiently, and in terms of operating facilities at minimum cost. Minimum cost construction and operation were taken for granted, and much of the economic literature focused on the rules for efficient pricing, and for determining the efficient level of investment (e.g. Rees, 1984). Thus cost benefit analysis would be used to assess new roads, railways, port facilities and airports. For many investments, externalities such as noise or congestion could be important, and thus major investment projects also were subject to environmental regulation and required to have planning permission.
In the past two decades, the model for transport infrastructure provision has shifted away from this approach. Two models of provision stand out. After extensive privatisation, a good deal of transport infrastructure investment is now undertaken by private firms. Since many of these possess some market power, these firms are subjected to regulation. The ways in which regulation is implemented have major implications for investment. Older forms of regulation, such as rate of return regulation, were considered to encourage excessive investment in capacity. Newer forms of regulation, which emphasise incentives for efficiency, removed the incentives for excessive investment, but in their simpler forms, they also created weak incentives to invest in capacity, and incentives to undersupply quality. Hence, the problem of getting investment right in the new regulatory environment has been a major issue.

Not all transport infrastructure is provided by private, regulated firms. A substantial proportion of it is still provided by governments, directly or via public enterprises. This is true of Australia and the United Kingdom, as well as Canada and even the United States. Thus there is substantial government in the provision of roads, rail track, port facilities and in some countries, airports (indeed there is probably more government provision of transport infrastructure in the US than there is in other countries like Australia, which used to rely heavily on government provision). However, within these generally public systems, there has been an interest in making use of some degree of private provision. Thus there may be private toll roads within public road networks, private tracks within public rail networks, privately owned terminals at public airports and private firms may develop or redevelop facilities such as terminals within public railways. With these types of investment, both public and private bodies are involved. The public interest is promoted through the contract between the government and the private firms, and explicit price regulation is not usually warranted. Several investments are once off investments, such as redevelopment of a railway station. The most common term for these mixed forms of provision is the public private partnership (PPPs).

Even in a world with considerable privatisation, major investments are a public issue. Governments become involved indirectly as regulators, or through the commissioning of projects. Governments also have an impact though environmental or planning regulation. Projects may require government involvement to secure resources, such as compulsory resumption of land. Many transport projects are politically controversial; especially the larger ones, and quite often governments will emerge as champions of specific projects (and to this end, they may override normal regulatory processes). To this extent, it is unlikely that a simple analysis of profitability by the firm making the investment will be a sufficient test of the public interest. A question arises of how well the economic benefits and costs, along with the broader public interest aspects, are being evaluated for transport investments.

3. COMPETITION, REGULATION AND INVESTMENT

It will be taken that the objective is to ensure that the quantity and quality of investment in gateways and corridors is right. Too little capacity gives rise to congestion and delays, which are costly, and gives rise to unsatisfied demand (for example, when airport or port capacity is rationed by slots). At the extreme, there may be bottlenecks, which are very costly to overcome. Too much capacity, or capacity which is provided at too high a quality, is also costly. Normally there is a
requirement for cost recovery, and excessive capacity adds to costs, and thus raises prices. A situation of overprovided capacity, which users stay away from because it is too expensive to use, emerges. What is sought is an institutional environment, which sets incentives for sufficient but not excessive investment. This presupposes that it is feasible for decision makers to access adequate information to make a rigorous assessment of investment projects.

The ideal environment is, of course, a competitive one. Firms in competitive markets do not possess market power, need to keep costs minimised, and seek to invest the optimal amount in capacity and quality. In the transport sector, competition is likely to be strongest at the operational stage, for example, in the running of trains or trucks, or in airline operation. Where capital is fixed and sunk, as in airports, port facilities, rail track and roads, there is more likely to be a situation of natural monopoly. There can be scope for competition between airports or port facilities, if they have different owners and are close by each other, and there can be competition between roads with different owners. Intermodal competition, such as that between road and rail, may be effective.

At least for a substantial part of the transport infrastructure, natural monopoly is likely to be present. Firms will possess market power. If they are private, profit seeking firms, they will have an incentive to use it. If they are public firms, they may still use market power to increase revenues to allow costs to be higher than the minimum, or to facilitate excessive investments. If firms are private, it is likely that they will be regulated, and the type of regulation, which is imposed, has strong implications for investment.

The link between regulation and investment has been recognised at least since Averch and Johnson (Baldwin and Cave, 1999). Firms which are subject to rate of return regulation, which sets an allowable rate of return on their capital base, can have an incentive to over invest so as to increase their capital base, and thereby, their profits. More generally, cost based regulation, such as rate of return regulation, is noted as having poor incentives to get investment right. Depending on the objectives of the firm, and how the price is set, there can be incentives for too little investment in capacity and quality, or excessive investment in capacity and quality.

The poor incentives created by cost plus regulation were the reason for developing alternative approaches to regulation, generally called incentive regulation. In particular, the early forms of incentive regulation sought to improve incentives for cost reduction. CPI-X regulation, whereby a firm would face an unchanging price path for a period of three to five years, was seen as a way of encouraging the firm to minimise its costs, since it would be able to keep any additional profits it earned by achieving lower costs, at least for the regulatory period (Armstrong, Cowan and Vickers, 1994). Pure forms of incentive regulation are rare, and hybrid forms are more common. These forms also take into account the firm’s costs when prices are set; thus they lessen the risks to the firm, but they also weaken the incentives for cost reduction. CPI-X regulation is often imposed with cost based resets of price caps at the end of the regulatory periods. CPI-X regulation has been popular in Australia and the United Kingdom for regulating monopoly transport and utility firms, especially those which have been privatised.

The investment issue was relatively neglected at the start, and the investment incentives set up under the new forms of regulation were not given much consideration (for a recent review, see Guthrie, 2006). If the price cap were set at a
level at least as great as long run marginal cost, and if prices were expected to remain at roughly the same level for an extended period, firms would be willing to invest where this is needed to provide capacity to handle additional demand. The problem of different time horizons of investors and regulators became recognised—regulators were setting prices for three to five years, but firms might be investing for twenty-five years. Such firms wanted some guarantees that prices would not be sharply reduced after the current regulatory periods (Armstrong, Cowan and Vickers, 1994, Ch 3). It became recognised also that price capped firms had a strong incentive to reduce quality, since lower quality would enable costs to be reduced, but since prices were set, this would lead to higher profit margins (Rovizzi and Thompson, 1992). This implied that investments in improving quality would not take place. It is also quite likely that current prices would be less than long run marginal costs in gateway or corridor situations. This would be the case if the firm faced increasing marginal costs—for example when expansion of a port or an airport involved increasing costs due to expensive land purchases or reclamation, or adding extra tracks to a railway in an urban railway involves expensive land purchases. It is also quite possible that existing prices might have been set based on low, historical costs of capacity, which could be well below replacement costs or costs of providing extra capacity at current prices.

For these reasons, there have been concerns that incentive regulation would be associated with underinvestment (Helm and Thompson, 1991). In practice, this might not be as serious a problem as it seems. While such incentives may be a property of pure incentive regulation, actual regulatory systems are more often hybrid systems, in which these incentives are muted. In addition, not all regulated firms are profit maximisers. Some firms, especially privatised former public enterprises, may emphasise size rather than profit. Thus firms subject to what has the form of incentive or hybrid regulation may over invest (Starkie, 2006).

These investment incentive problems have been recognised, both by governments when setting up regulatory environments and by the regulators themselves. In the hybrid system of regulation, regulators make forecasts of demand, and the necessary capacity, and set price caps such that revenues will be sufficient to cover the forecast costs, including the costs of the investments in extra capacity or quality. Thus the UK CAA recognised that additional investment in terminal capacity at London’s Heathrow airport would be expensive, and its current price cap allows for rising real prices (Hendriks and Andrew, 2004). In Australia, when airports were regulated, there was provision for the regulator to allow prices higher than the price cap if airports were making investments necessary to increase capacity (this implicitly recognised that the initial prices were set at a level lower than long run marginal cost). In addition, there was provision for the regulator to allow prices to be increased over the capped levels if the airport was investing in providing higher quality (Forsyth, 2003).

In each of these examples, the regulator assesses the proposed investments and decides if a price increase is to be allowed to fund them. There have been attempts to set in place less prescriptive arrangements. The UK CAA initially proposed to link price caps to output for the airports—higher output would necessitate investment in capacity, and the airports would have an incentive to provide this capacity to enable the output increases to take place (Hendriks and Andrew, 2004). In the end, this approach was rejected in favour of the one described above. Some regulatory systems
include incentives to increase quality, as measured by some indicators. This constitutes an indirect investment incentive.

The key characteristic of all these arrangements is that the regulator is the key decision maker when it comes to investment. Firms may make proposals to the regulator, but it is the latter which decides whether it will allow higher prices on the basis of the investment. The regulator will have to make an evaluation of the investment according to the objectives it is seeking to achieve. If the regulator is not prepared to allow the firm to charge prices which are sufficient to make investment worthwhile, the firm will not invest. Even if the more indirect incentives based approach is adopted, it is the regulator, which sets the parameters, which determine how strong the incentives for investment are.

How well this works depends on the regulator’s information and objectives. The regulator will rely on the firm for information about the need for capacity and the cost of expanding it, and the firm will probably not have an incentive to report this information accurately. Faced with these difficulties, some regulators simply take the firm’s capital expenditure plans as a given. The regulator may be subject to political pressure to ensure that what are perceived as “essential” infrastructure investments go ahead, and thus approve a higher price cap. Under these circumstances, hybrid regulation may work in much the same way as cost plus regulation, and encourage excessive investment and higher prices.

The complexities of regulation will be increased if there is vertical integration of the facility owner and the operator - for example, when a single owner owns both trail track and trains. Vertical integration does have significant advantages - the firm has a clear incentive to ensure that the provision of the capacity of the facility is adequate but not excessive. However, if there is to be competition at the train operation level, the vertically integrated firm will have to open up its track for use by its competitors. Such a firm will set high prices for access, which will stifle competition. To promote competition, the regulator will set lower prices. It will need to balance setting low prices to promote competition with setting prices high enough to give the facility owner the incentive to invest. To get this balance right, the regulator will need to know a lot about the firm’s costs, and the costs of expanding its capacity. There is the risk that a well-intentioned regulator will set prices too low and cause inadequate investment for the long run.

The regulatory environment is also one in which gaming, by the regulator and by the firm, is likely. A regulator may seek to gain favour by being tough on the monopoly firm, and keeping prices low for its customers. In the short run, the firm will still earn profits, but with the price caps as set, it may not be prepared to invest. The long run consequence will be inadequate capacity and higher costs (Exports and Infrastructure Taskforce, 2005).

The firm too can become involved in gaming. The regulator may be concerned for the long run consequences of its decisions, and seek to set prices which are sufficient to encourage investment. In addition, the regulator may be under pressure from the government to ensure adequate investment. The firm may be offered a regulated price at which it can earn a profit, but it may refuse to invest unless the price it is allowed is increased. As a result, the regulator may cave in, and allow a higher price than it believes is necessary. This may not be the end of the matter, however. In spite of being allowed the higher price, the firm may not deliver the investment as promised. The regulator can get around this by making the higher price
cap conditional on delivery of the promised investment (as is the case with the CAA’s regulation of London Heathrow airport—see Civil Aviation Authority, 2006). Such conditionality ensures that the investment does take place, but this investment can be excessive. Again, the success of the approach depends critically on how well informed the regulator is on the need for, and cost of the additional capacity.

Gateways and corridors often consist of chains of discrete sections of infrastructure, such as ports, port facilities, intermodal hubs, roads, rail track and train operation. These components of gateways and corridors may well have different owners and be subject to different regulators. In this situation, the coordination of investment becomes very difficult. It is difficult enough to ensure that one regulated firm undertakes the right amount of investment, but it is much more difficult to ensure that all the interrelated facilities have efficient and consistent investment programs. Hence, when different owners and regulators are making decisions about investments in a chain, bottlenecks can readily develop. This has proven to be a real problem for the coal export industry in Australia, with mines, rail track and operation, ports and coal loaders having different owners and regulators (Export and Infrastructure Taskforce, 2005). By contrast, the iron ore export chain, which is integrated under one owner from mine to ship, has encountered few problems of investment inadequacy.

Light-handed regulation is sometimes suggested as a way around these investment problems. While light-handed regulation may be desirable for other reasons, it is not likely to be the answer to the investment problem. Light-handed regulation may take the form of imposing no specific regulatory constraints on the firm, but subjecting it to a review at some point in the future. If it is assessed as having performed poorly, a sanction, such as direct regulation, could be applied. Under this approach, the firm has discretion over its investments. However, the incentives it faces to get investment right depend critically on the criteria that the review body uses. If the review body assesses whether the firm has been using market power by comparing revenues to costs, this will amount to quasi cost plus regulation. The firm will know that if it makes excessive investments and puts its prices up to cover their costs, it will not face any sanction. Only if the review body undertakes an explicit cost benefit analysis of the firm’s investments will there be any pressure for the firm to ensure that it only undertakes efficient investments. Light handed regulation can go hand in hand with excessive investment, especially if the firm is under pressure from national or regional governments to avoid inadequacy of capacity.

Another approach is to encourage negotiations between the infrastructure provider and its customers. In many cases, the customer base will be concentrated, and negotiations will be feasible. When it comes to smaller investments, which the customers are willing to pay for, such negotiations can be fruitful. However, when it comes to major investments, about the merits of which the customers are divided, successful negotiations are less likely. In addition, the negotiating strengths of the parties are very different—a monopoly infrastructure provider is in a much stronger position than its customers. If it chooses to go ahead with an investment they do not want, it can still make the investment and raise its prices to cover the cost. Just as the firm can hold up the regulator to gain an excessive price to undertake an investment, it can do likewise with its customers. This approach has been tried with the UK airports, though it takes place within a very prescriptive form of regulation of prices.
and investment (Office of Fair Trading, 2006). It appears to work quite well except where there are sharp divisions of opinion about the need for major investments.

In summary, different regulatory structures have different implications for investment. Some designs are much better than others, though all have their difficulties. Incentive regulation, with investment provisions, or indirect investment incentives, is the most promising approach. It does, however, involve active participation in the investment decision by the regulator, and it presupposes that the regulator can gain access to good information about demand and the cost of new capacity. A passive regulator, which accepts the firm’s investment proposals uncritically, risks the excessive investment, which arises under a cost plus approach. Regulatory decisions on allowable prices are critical in determining which investments go ahead. Granted this, one needs to ensure that the regulator has information, which is as good as is feasible, and that it operates in an environment, which encourages it to pursue efficiency.

4. PUBLIC PRIVATE PARTNERSHIPS

Public private partnerships, or PPPs, have become increasingly popular as a means of infrastructure provision. Essentially, they involve privately built or operated facilities in public networks. They can be used when a system is not fully privatised. Thus, it may not be feasible to privatise a network in its entirety, such as with roads, or when there can be a desire to keep some aspects of a network public, yet take advantage of private involvement in investment.

Over the past decade, the United Kingdom and Australia have relied extensively on PPPs, and while in some situations their use is ad hoc, some jurisdictions have set policies guiding their use (e.g. the State of Victoria in Australia—see Department of Treasury and Finance, 2001 and Fitzgerald, 2004). They may be used routinely for small projects, such as the redevelopment of a rural hospital, or for very large projects, such as the renewal of the London Underground. Within Australia, PPPs have been used for federal and state infrastructure projects. At the federal level, a PPP was used for the North-South, Darwin to Alice Springs railway. In New South Wales, PPPs have been used to build a Sydney Harbour Tunnel, a Sydney Airport Rail link and a Sydney Cross City Road tunnel. In Queensland a PPP was used to construct an Airport Rail Link, which also links terminals at the airport. The state of Victoria has used them to upgrade rail track for fast trains, to redevelop the main rail passenger terminal, to build and operate toll roads, and will probably use a PPP for a harbour-deepening project.

The scope of PPPs is quite broad. They may involve building and/or operating facilities. Some have become similar to normal regulated enterprises (such as the toll roads), others are primarily building contracts (rail terminal redevelopment), and others are primarily about the operation of systems (the Melbourne urban passenger system). To a degree they are not new, since variants have been around for some time. Australian road authorities have long contracted out the building of roads. Often PPPs have been initiated by private developers, who sell their ideas to governments. As compared to direct public provision, a number of advantages and disadvantages can be identified (see also Fitzgerald, 2004; Hodge, 2004).

Advantages include:
- Private handling of risks. Private firms may be more effective in their control and minimization of risks than public bodies.
- More efficient project management. Private firms may be able to deliver a project at low cost and on time since they are more focused on outcomes, and less subject to intervention.
- Gains from competition. If a project is let out to competitive tender, and the costs are compared to those of undertaking the project in the public sector, a least cost solution can be achieved.
- More efficient operation. If there is an operation phase in the project, private firms may be able to keep costs down more effectively since they gain profits from doing so.
- Gains from specialisation. The private sector developer may have much greater expertise in providing the particular type of facility than the government.

As against these, there are disadvantages:

- Higher costs of risk bearing. While private firms may manage risks better, they have fewer opportunities to spread risks than the government, thus potentially increasing the cost of the risks.
- Higher transactions costs. PPPs involve contracts between entities, and this will be more costly than doing everything in house. Contract specification can be very expensive (see Wolmar, 2002). Furthermore, since it is never possible to cover all contingencies, litigation can come about and this is typically expensive.
- Higher costs of finance. At least the apparent costs of finance will be higher for private firms than the government.
- Cost recovery requirements. The fact that the expected revenues must at least equal costs, otherwise the private firm will not enter the contract, imposes a requirement that arrangements, such as restrictions on competing facilities, be set in place to enable the project to cover costs.

These last two points can be expanded upon. Governments can borrow more cheaply than private firms. Governments borrow at the government bond rate, while private firms borrow at private debt rates, which are higher than government rates because of the greater risk of default. In addition, some finance invariably comes from equity, with a still higher cost. Thus the weighted average cost of capital for a private developer of a project will exceed the government-borrowing rate. However, this is not comparing like with like. When a government borrows to fund a project, it is not the case that the risks are zero or minimal. The project may still be quite risky, but the government absorbs the risks directly - the risks of the project are not reflected in the borrowing rate. Thus the all-up cost of government provision is underestimated when finance is costed at the government-borrowing rate. This said, there is still the matter of the equity premium - the higher cost of equity cannot be fully explained in terms of the costs of risk bearing. Indeed, it cannot be explained satisfactorily - it is one of the great unresolved puzzles of economics. To this extent, private finance is more costly than government finance.

Several projects, which are financed through PPPs, have difficulties in covering costs. These projects may either be good or bad in terms of more general welfare criteria. However, if a government wishes to enable them to go ahead using a PPP, it
needs to devise some means of increasing the revenues to the private developers. One approach is to grant a direct subsidy - this was done in the case of the Darwin to Alice Springs railway. Another approach is to cross subsidise the private part of the project from a profitable public part of the project - thus, the Sydney Harbour Tunnel was subsidised by the profitable Sydney Harbour Bridge. An alternative approach, all too often employed, is to restrict competition for the new facility, thereby artificially increasing demand for it and thus revenue. Thus Sydney airport buses were removed after the Airport Rail link came into operation. When the Sydney Cross City road tunnel was recently opened, alternative roads were closed (this created much congestion and was highly unpopular, and the government then broke the contract with the developer and re-opened the roads). Sometimes, there may be no limits on existing competitors, but governments commit themselves to not providing any facilities in the future which might compete with the PPP. These restrictions on competition or on future actions by the government must be one of the least efficient ways of providing infrastructure.

It should be noted that one of the key claimed for benefits of PPPs has not been mentioned. Often PPPs are advocated on the ground that they relieve pressure on the government budget, and enable projects which could not have otherwise been afforded be undertaken (Fitzgerald, 2004). However, this is not a genuine benefit, since of all entities, governments are least constrained by capital markets. If governments wish to borrow to finance a project, they can. It may be that governments wish, essentially for reasons of window dressing, to limit the budget deficit, or achieve a specific surplus. However, this is a self-imposed constraint, which serves no macro or micro economic function. If the project goes ahead with private finance, it has the same macroeconomic impact, and if it earns a rate of return, which it must be expected to do if the private sector is involved, it will create no excess burden of taxation, and thus no different microeconomic impact.

Granted that governments these days often do impose arbitrary limits on budget deficits, PPPs can have a positive effect in enabling good projects to go ahead which otherwise would not. They also facilitate poor projects to go ahead as well. However, providing a way of getting projects off budget is neither a valid argument for or against PPPs. It would be a concern if projects are being funded through PPPs even though direct government funding is less costly simply to gain an illusory benefit. The record of PPPs in Australia is at best, very mixed. There have been major problems with several of them, and their reputation is questionable. Some actual and perceived problems with them are as follows:

- Project forecasts are too optimistic and they do not deliver as promised. This can be true of any projects (Flyvbjerg, Bruzelius and Rothengatter, 2003), and it is not clear that it is a worse problem for PPPs.
- Disputes have been common and litigation has been costly. This is so for some projects.
- Competing facilities have been restricted. This is quite a common problem.
- They have been used as ways by governments to facilitate poor projects going ahead. There have some cases of this.
- Poor governance. Governance arrangements are ad hoc and non transparent (Hodge, 2004).
Risks have been borne by governments rather than the private developers. This has been so for major projects such as the Airport rail links (Walker and Walker, 2001), some road projects and Melbourne public transport.

Part of the idea of PPPs is that the private developers should bear and manage the risks. In practice, it does not always work out this way. PPPs are sometimes designed so that the government bears most of the risk. This may be intentional - governments may be keen to see projects go ahead, and they may be prepared to bear the risks so that the private developer is willing to become involved. Sometimes governments are unaware of some of the risks they are underwriting. Finally, it may be that the contract specifies that the private developer bears the risk, but the contract is not enforced. Once a project has begun, governments are hostage to the builder. If the private developer is encountering problems, it may threaten to walk away from the project unless the government covers the risks. Governments, which face large political costs if projects are not completed or seen to be successful, will be prepared to pay up. This has happened several times in Australia. More broadly, PPPs cannot be regarded as a means of eliminating or minimizing political influence in infrastructure provision.

PPPs have sometimes failed because of poor design. This may be accidental or intentional. Thus contingencies may not be allowed for because inadequate research has been done. However, there are also cases where poor designs of projects have been knowingly entered into. Some governments seek to have it both ways - to be seen as providing popular projects, which are not self-financing, but to also earn revenue from them. However, clever financial engineering cannot turn poor projects into good ones, and problems emerge. When constraints are put on competing facilities, there is a good chance that a government is trying to have it both ways (as with the Sydney Cross City tunnel).

This discussion has focused in on the deficiencies of PPPs, but it has not said much about the deficiencies of the alternative means of infrastructure provision, such as publicly funded and developed facilities. Some of the problems with PPPs do not exist with these - for example, problems of sharing risks, contract specification and litigation. However, public provision also has problems, which are not as evident. Thus risks can be poorly managed, and there can be cost overruns. These happen, but they may not be apparent - all that happens is that a public project receives more funding than intended from the government. Any problems are quietly sorted out within the government, rather than through litigation, or exposure by the press. The facts that at least two parties are involved with PPPs, and relations are through contracts, means that the problems which do develop are likely to be much more open.

As experience of using PPPs increases, it should be possible to make more rigorous assessments of the alternative ways of providing infrastructure. A literature on this is beginning to develop, though it is not extensive yet. What is clear is that PPPs can be much better designed and implemented than they have often been. While it is never possible to allow for all contingencies, the major likely contingencies can be provided for. Risks can be allocated to the parties, which can manage and bear them most efficiently. The reliance on poor practices, such as restricting competing facilities and making commitments not to undertake investments in alternative facilities can be minimized. It helps if governments set out principles to be applied in the use and design of PPPs (as in the state of Victoria in Australia - see Department of Treasury and Finance, 2001), and if they keep to the principles they have developed.
5. PROJECT EVALUATION

Whichever institutional form is chosen to deliver infrastructure, be it public provision, private regulated firms or PPPs, an efficient pattern of investments will require that all projects be submitted to a rigorous evaluation. Until recently, this proposition was taken for granted. There is no problem of availability of suitable tools for evaluation—some projects, financial appraisals are sufficient, and for others which give rise to indivisibilities, externalities or are impacted on by distortions, cost benefit analysis is the preferred technique for evaluation. However it is no longer the case that rigorous evaluation can be assumed—there seems to be growing reliance on inferior methods of evaluation. These techniques yield much higher estimates of benefits than cost benefit techniques, and make projects appear much more beneficial. Gresham’s Law is now applying to project evaluation.

The issue is one of how to ensure that projects are subjected to rigorous evaluation. There is little debate about the techniques, and the theory behind preferred techniques has been well set out. Problem areas do exist, but they can be allowed for. However, in countries such as Australia there is a growing reliance on alternative approaches, such as impact studies. These are described as “economic evaluations” of projects. At best they use techniques which may be valid for other purposes, but which are not designed for, or appropriate for, for investment evaluation. When used as investment evaluation tools they make implausible assumptions, such as all resources used in the project have zero opportunity cost. As a result, they deliver very large estimates of “benefits”, which are appealing to the proponents of projects. Many projects, some of very large scale, are not subjected to any public form of cost benefit analysis—rather, impact studies are done, and the projects are justified on the basis of these. The supplanting of rigorous techniques by misleading approaches which more or less guarantees that every project produces “benefits” well in excess of costs is posing a major problem for infrastructure investment.

When infrastructure firms are privately owned, there can be effective evaluation of investment projects. If firms are in a competitive market, and market imperfections are unimportant, profit-seeking firms will have a strong incentive to evaluate their investments carefully, and profitable investments will be investments, which enhance welfare generally. If market power is present and regulation is used to limit the use of this market power, there can be an effective investment evaluation process. This could, in principle, take place within a cost plus or rate of return regulatory framework, but in practice, careful analysis of investment proposals is not noted within this framework. As noted earlier, incentive regulation does pose problems for investment, though they can be resolved. Effectively, it requires that the regulator do a cost benefit analysis of investments proposed by the regulated firm. For example, with an investment which improves quality rather than expands capacity, the regulator will assess whether the benefits of higher quality to the users are greater than the costs to the firm. It will then seek to set regulatory parameters so that the optimal amount of investment is forthcoming. Thus, in principle, with a well-designed incentive regulation framework, investments can be assessed rigorously. It is possible, however, that governments will override regulatory decisions for major projects, and when they do, they may not assess these projects rigorously.
How should infrastructure investments be evaluated? The standard answer is by cost benefit analysis. Cost benefit analysis relies on a rigorous and thorough theory of investment evaluation, which seeks to be comprehensive in its coverage. The practice of cost benefit analysis has grown up over several decades, so that there are few difficulties in applying it to transport infrastructure (many guides to CBA exist—see, e.g. Boardman, et al.). In spite of this, its use appears to be declining, and many investments are assessed (or perhaps, justified) using other techniques. Sometimes alternative approaches are described as “cost benefit analysis” even though they bear little resemblance to standard CBA techniques. In Australia, many major transport infrastructure projects are given the go ahead even though not publicly available CBAs are done.

Impact studies are often used as an alternative. These studies seek to measure the impact on gross output or employment of an investment. They usually rely heavily on input output studies. Expenditure, at the stage of the investment or when the project is operating, gives rise to multiplier effects, and a final impact on Value Added, Gross Domestic product or Employment is calculated. Indirect impacts are assessed using input output models, and are included in the overall assessment. Typically, the impacts on GDP are described as the “benefits” of the project. Also, typically, these “benefits” are large relative to the initial investment.

There are several reasons why such studies should not be used as a means of investment assessment (Niemeier, 2001; for a recent discussion of the limitations of such studies, along with an examples of the application of CBA and computable general equilibrium (CGE) techniques to assess investments in special events, see Victorian Auditor-General’s Office, 2007). For a start, input output models embody no opportunity costs—inputs come freely from somewhere, and are used to increase output, but the costs of these inputs is assumed to be zero. Secondly, input output studies are essentially partial studies—while they measure the positive impacts on output, they do not take into account the negative impacts on output elsewhere as a result of reduced availability of inputs. Input output studies can be used for specific purposes. For example, they might be used to assess the impact on output and employment in a local region as a result of an investment. However, they cannot measure the impact on output of the state or nation as a whole, because they ignore the negative impacts on other parts of the economy. Furthermore, impacts on output cannot be taken as a measure of “benefit” since the costs of obtaining this output are not counted. In spite of this, investment assessments using input output approaches are being commonly used, and impacts on local economic output are being described as national economic benefits (for a critique, see Waters, 1976).

More recently there has been some use of (CGE) analysis for assessing the impacts of investments of GDP and employment in the economy as a whole. CGE models are comprehensive models of the economy, and they address many of the failings of input output models (Dixon and Parmenter, 1996). In CGE models, inputs do have a cost, and increasing output in one sector draws resources away from other sectors, reducing their outputs. They embody labour and foreign exchange markets, along with representations of government taxing and spending behaviour. They provide a best practice means of assessing the impacts of an investment on GDP and employment. They are extensively used in policy analysis in Australia, often though not always appropriately.
This said, changes in GDP cannot be used as a measure of the benefits of the project to the economy, except under very special conditions. If additional labour is used in creating additional output, it will have a cost, unless the additional workers are prepared to work for nothing. CGE models do not capture positive and negative externalities of the project, unless they have been explicitly built in. Typically they will not capture consumer surplus benefits of a project which provides an indivisible lump of additional capacity. CGE models rely on assumptions about the way labour markets work, and results are very sensitive to these - large impacts on GDP and employment will be estimated if excess labour supplies are assumed. Clearly, if actual labour markets are tight, modelling should reflect this - something, which does not always happen (for a critical view, see Bureau of Transport Economics, 1999).

CGE models can have an important role in investment evaluation. Traditional CBA studies are partial equilibrium studies, and do not take any general equilibrium effects. In principle, CBA studies should take these into account. If markets work well in general, and there is few significant distortions, taking general equilibrium effects into account will not make a large difference. However, it could be that distortions are significant in some markets affected by the project (e.g. a project is labour intensive, and labour is in excess supply in a region, or some inputs such as fuel may be heavily taxed).

Projects may stimulate economic activity, and this can have a value. This could well be true of a gateway or corridor project - it could bring economic activity to a region. Some means of estimating the change in economic activity in the region is needed, and a CGE model provides this. A normal CBA is not able to handle this aspect. With information about the value of the changes in output, as well as the changes in inputs and their prices, the benefit from this increased economic activity can be estimated, and used in a CBA. A project in a depressed region may produce a positive impact on economic activity, and this is a benefit, which should be taken into account. Terms of trade effects may be a source of benefit, which can be picked up in a CGE study, which might be ignored in a partial equilibrium study.

Thus CGE modelling should be regarded as a complement to CBA, and integration of the two promises a rigorous means of incorporating effects, which are not taken into account very well, or at all, in typical CBAs. The relationship of CGE modelling to CBA is a promising avenue for further development. However, it should not be regarded as a substitute for CBAs, and the impacts on GDP should not be accepted uncritically as the “benefits” of the project. Like other forms of analysis, they can be misused. In particular, studies, which report large impacts on GDP and employment, in economies with tight labour markets, should be regarded with suspicion.

There is something of a growing problem in investment evaluation. Evaluations are becoming less rigorous, and systematically more optimistic. To an extent this has come about as a result of use of rigorous techniques but with optimistic forecasting. In transport as well as other forms of infrastructure, around the world, there is a well-documented pattern of underestimation of costs and overestimation of demand (Flyvbjerg, Bruzelius and Rothengatter, 2003). In addition to this problem, there is a growing move away from more rigorous techniques of evaluation towards techniques which purport to measure the benefits of projects but which provide gross overestimates. Even rigorous techniques such as CGE analysis, can be used inappropriately, and sometimes are.
The consequence is that all projects look very good. It is very easy for the proponents of a project to produce studies, which show their project in a very favourable light. Investment analysis ceases to have a role in the selection of investments. It is not possible for a decision maker with the public interest in mind to select the best transport infrastructure projects, since all projects on offer appear to be highly beneficial. It is however possible for decision makers who wish to promote particular projects on non-economic grounds to claim support for their position.

6. CONCLUSIONS

When it comes to investment in infrastructure, no institutional arrangement is first best. All approaches have identifiable problems, which can be remedied, but only by exposing the system to other problems. We are dealing with a highly constrained situation, in which a first best solution is not feasible. Getting investment incentives right is a difficult problem, because of this wide range of problems, which intersect and make the issue more complex.

Nevertheless, good progress on developing tolerably efficient options has been made, and there are reliable guidelines as to what should not be done. Incentive regulation (along with the more common hybrid forms of regulation) does have desirable properties, but explicit attention needs to be paid to the incorporation of specific investment incentives. Public Private Partnerships can be designed well - they can clearly specify who bears what risks, they can be opened up to competitive tender, and they can avoid achieving profitability by imposing restrictions on competing facilities and operations. The investment evaluation task remains critical, for the government choosing which projects to invest in directly and to open up for PPPs, and for regulators setting price parameters or investment incentives so as to encourage an efficient level of investment in the firms they regulate. Governments and regulators can use thoroughly based techniques such as cost benefit analysis, and do not have to rely on inappropriate and misleading alternatives.

Decision makers need not, and do, not always choose to implement efficient institutional structures and to approve only worthwhile investments. Sometimes they do give high priority to promoting industry efficiency - in Australia, this was the case during the period of Microeconomic Reform from the mid 1980s to the mid 1990s. At other times, the emphasis on good microeconomic performance is weak, with decision makers being willing to make only very modest progress with institutional reform, and enthusiastic to promote poor projects. Good options, to promote efficient investment in the infrastructure, which makes up gateways and corridors, are available, and it is up to decision makers to decide how much they wish to avail themselves of them.

REFERENCES


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