

# **Private Sector Participation in Infrastructure Investment**

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**P**rivate participation in the provision of infrastructure is less than was once expected, particularly in developing countries. Some reasons for this are identified in this paper. It is argued that the problem of dealing with market power in the provision of infrastructure services is similar to that of other forms of procurement in the presence of long-lived and immobile assets employed specifically to produce an item or service. From this perspective, comments are offered on the inhibitors to private participation and on features of contract design that might limit impediments to private investment in this sector.

The financing required for infrastructure services in East Asia and the Pacific over the next five years was recently estimated at over US\$300 billion, with the bulk of this needed in China (see van der Linden, 2004). The figure will now be even larger following the 2004 Boxing Day Tsunami. The construction of new assets and the renewal of existing assets are both required. With private sector support, these tasks could be met more efficiently. Yet flows of private investment into the infrastructure sectors of developing countries peaked in 1997 and have declined ever since — the turning point explained in part by the Asian financial crisis (Harris, 2003). There has also been a high rate of renegotiation of contracts, suggesting that the structure of the arrangements has been an important contributor to the reconsideration by private investors of these types of projects. Harris (2003) refers to a ‘widespread pessimism’ about private infrastructure projects.

Some of the issues in the provision of infrastructure services, including the risk of the abuse of market power and the value of separation around the key bottleneck element in the supply of infrastructure services, are reviewed in the next section. How the private sector might contract with the government is then examined and the case for a complementary relationship between regulatory institutions and the use of contracts is made. Options are presented for the operation of the regulatory process, with special attention to rules on price setting. The final section summarises some implications for designing policy on private sector participation in infrastructure, with particular attention to the situation in developing countries.

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## Value of Separation

Options for private participation depend first on identifying the monopoly element or 'bottleneck infrastructure' and second on deciding whether to separate it from the competitive components.

Consider the case of electricity supply. Generation is upstream from the retail market. Firms buy electricity from the generators and re-sell it to households. All the parties are linked by a system for distributing the electricity comprising long-distance and local grids. The distribution network is essential, all parties must be able to access it, but the nature of the economies of scale in transmission and distribution is such that these networks are not worth duplicating. The distribution network is therefore a bottleneck facility, and any firm that controls it could (in the absence of regulation) earn profits by charging monopoly prices for its services.

The World Bank (2002:Chapter 8) reviewed three options for the structure of businesses around a bottleneck component:

- A: *an integrated firm subject to competition in the non-bottleneck market* (and provision for non-discriminatory access to the bottleneck); in the previous example one firm could provide generation, transmission and distribution services and have to compete with other combinations of generators and retailers who have non-discriminatory access to the bottleneck facility.
- B: *an integrated monopolist* (with no provision for access to the bottleneck facility): in this case there is no competition from other combinations of generators and retailers.
- C: *vertical separation with competition* with separate firms providing the activities of generation, transmission/distribution and retailing.

Four decision-making criteria were identified by the World Bank:

- the extent of economies of scope in joint operations in the bottleneck component and in the competitive market (the question is whether combining generation, distribution and retail activities lowers the cost of delivery of electricity to consumers compared to a system in which these operations are separated);
- the ease of detecting any discrimination by the bottleneck facility owner in favour of its own subsidiary operating in the competitive market (in the example above, the retail operation owned by the integrated firm);
- if such discrimination occurs, the consequences for competition if it remains undetected; and
- the likely degree of competition in the non-bottleneck market.

The World Bank (2002) proposed that the following combination of characteristics favoured the various options summarised in Table 1.

**Table 1: Options for Separation or Integration**

<b>Option</b>	<b>Bundle of characteristics</b>	<b>Example of an appropriate allocation</b>
A: vertical integration plus competition in the non-bottleneck market	Large economies of scope and easy detection of discrimination. If discrimination does occur it has little effect on a highly competitive downstream market	Telecommunications
B: integrated monopolist	Large economies of scope but a high degree of difficulty of detection of discrimination. If discrimination occurs, it has a significant effect on competition in a less than highly competitive downstream market	Water (although possible that option A is also relevant to this sector) Rail (with competition between tracks in large economies — some economies have experimented with option C)
C: vertical separation with competition	Small economies of scope but a high degree of difficulty of detection of discrimination. If discrimination occurs it has a significant effect on competition in the highly competitive downstream market	Electricity supply

Source: World Bank (2002:155-158).

According to Table 1, the solution varies between sectors according to their characteristics, the nature of the economies attached to the stages of production, and the character of competition in downstream markets.

Gomez-Ibanez (2003) describes a trade-off in unbundling between the benefits of competition and the increased costs of coordination. After unbundling, the bottleneck supplier no longer deals directly with customers. Customer demands for service vary significantly and the investments made by the bottleneck supplier make a critical difference to services that the downstream firms can provide. While the airlock introduced by unbundling avoids discrimination in favour of the bottleneck provider's own retailer, it also increases the transactions costs associated with coordination among the stages of production of the service.

Having decided the appropriate point of separation, the next question is how to engage the private sector in the provision of the bottleneck component of the service.

### **Contracting for Natural Monopoly**

Contracting problems arise when a firm invests in assets with long lives to supply particular customers and then the customer also makes specific investments that are durable, immobile and particular to the relationship (Gomez-Ibanez, 2003). The service provider makes specific investments to supply a particular community — for example, a network of water pipes — and, as Gomez-Ibanez (2003) explains, cannot relocate if the community (or the government representing them) decides to offer lower prices. But the customers also make specific investments to consume the services of the infrastructure service provider. If the company decides to charge much higher prices, the customer seeking to avoid those charges and find lower prices would have to move to another community, where they could face the same problem once committed to buying services from the new supplier.

The problem is that these risks of opportunistic behaviour inhibit the investments required by both parties to generate lower costs in the transactions. They therefore under-invest in the specific assets and over-invest in other options to protect themselves against opportunism. Both parties lose as a result.

A solution to this problem is for the parties to commit to each other not to behave opportunistically in this situation by signing a long-term contract. As Gomez-Ibanez (2003) explains, use of contracts in infrastructure transactions is complicated by two factors. One is the number of parties involved. Contracts are easier to write when there is one buyer and one seller. In the case of infrastructure services, there is one seller but many buyers, which increases the transactions costs incurred. The government could take the place of the buyers, implementing, ideally, the same contract that the consumers would have signed had the transactions costs been zero. But the government has its own interests and may not do so.

Another problem in contracting is the risk of incompleteness. To protect against opportunistic behaviour, the contracts must last as long as the assets' life, but the longer the contract, the more likely it is that the circumstances in which it operates will change. Developing economies, especially, experience not only substantial technological uncertainty but also demand uncertainty (Kessides, 2004).

Various contingencies can be included in any contract, and an appropriate distribution of the risks in each circumstance could be spelt out in advance. But over a long period of time, as is relevant for infrastructure assets, it is difficult to include all relevant contingencies and agree on ways in which the parties will respond. It is highly likely therefore that any contract will prove to be incomplete. Solutions to this problem are to introduce a framework for renegotiation (Aghion, Dewatripont and Rey, 1994).

Stern (2003) illustrates the nature of the incompleteness of infrastructure sector contracts, referring to the application of contracts in the UK rail and electricity sectors. Incompleteness creates the scope for renegotiation that leaves both parties better off (or at least one no worse off), and regulatory agencies can facilitate this renegotiation, as Stern (2003) explains. He points out that this role is especially valuable in infrastructure sectors with large investments in sunken assets and in which new information on costs and technology emerges over time.

With respect to developing countries, Guasch, Laffont and Straub (2003) review a data set of nearly 1000 concessions in Latin America from 1989 to 2000. They report that over 40 per cent had been renegotiated by 2000 — in transport, 53 per cent, and in water 76 per cent had been renegotiated, with the renegotiations taking place, on average, 3.1 and 1.6 years after signing respectively.

Guasch, Laffont and Straub (2003:27) suggest complex contracts that attempt to deal with the problem of incompleteness could be counterproductive if they 'lack transparency, contain contradictory requirements and lend themselves to opportunistic revision claims'. The latter is an important point. Contracts that contain provisions for flexibility increase the risk of moral hazard as participants have the incentive to abuse that provision. For example, a contract could be won by bidding a low price, on the expectation that it could later be renegotiated. Guasch, Laffont and Straub (2003:27) suggest instead the use of a short contract document with 'general rules...found in laws and the relevant jurisprudence' implementation of which would be the role of the regulator. They find that the presence of a regulatory agency, set up in advance of the contract, reduces the likelihood of renegotiation. Stern (2003:211) interprets these results to say that the regulatory agency allows 'more incompleteness in contracts while maintaining a low risk of contract failure'.

Contracts relevant in the infrastructure sector vary in their scope because of the range of possible forms of relationship between the service provider and the government. At one extreme, the private sector owns the assets, collects the

revenue, and manages investment, but is subject to government regulation of prices. At the other extreme, the government performs all these roles. There are intermediate cases, such as when the government owns the assets but the private operator manages the capital investment, collects the revenue and bears the commercial risk (namely, a concession). Alternately, the government might manage the investment and the private sector the operations, while both share the commercial risk (that is, a lease).

The extent of political support for reform affects the choice of contract structure. Where the private sector recovers costs through collecting the revenue earned by sale of services (as in a concession or lease), the price-setting process must generate sufficient income. Kessides (2004:65) stresses the importance for private participation of setting prices that recover costs, arguing further that utility pricing is not the best mechanism for income re-distribution. Harris (2003:Figure 9) reports that the gap between prices and costs was greatest for electricity and water in the early 1990s (60 per cent cost recovery for electricity and 30 per cent for water). Rosenzweig, Voll and Pabon-Agudelo (2004:21) in their review of the experience of power sector reform say that the:

most critical factor in a viable reform process is the government's will to support necessary changes when faced with the prospect of higher prices for power that opponents would criticize vigorously.

The question then is whether the price increases needed to raise adequate revenue are politically sustainable. Harris (2003) concludes that some governments overestimated their capacity to manage the price reform required, though in other cases governments may also have behaved opportunistically and not implemented a commitment to raise prices once the investment was in place. The problems of sustaining and implementing reform vary between sectors. Where prices are already close to cost recovery and where buyers are final product or service producers, reform is easier (for example, telecommunications). But where the level of cost recovery is lower, and where households are more important sources of demand, private participation is more difficult to arrange.

If political support for price reform is insufficient, the forms of contracting with the private sector may necessarily be limited, for example, to management contracts, or perhaps to building facilities (Brook Cowen, 1997). The incompatibility between the extent of political support and contract choice is therefore another contributor to contract failure and private sector withdrawal.

The next section provides further discussion of the activities of the regulatory agency, in particular price setting.

## Regulatory Institutions and Price Setting

Options for price setting include, at one extreme, rate of return regulation, and at the other price cap regulation. A sample of recent literature comparing these options is Kirkpatrick and Parker (2004), Ergas and Small (2001) and Ergas (2004).

The options can be summarised in the following model. Let  $p$  be the regulated prices,  $C$  be actual costs and  $C^*$  be expected costs. If price ( $p$ ) equals actual costs ( $C$ ), so that  $p = C$ , the problem is that there is no incentive to minimise costs. The alternative is to base price on expected costs ( $p = C^*$ ) and allow the regulated firm to keep (or bear) any margin between price and actual costs. The firm is then fully rewarded for reducing costs below the level expected. Price could also be set to depend on both actual and expected costs of the firm:

$$p = C + \beta(C^* - C) = \beta C^* + (1 - \beta)C \quad (1)$$

In this equation:

$\beta = 1$  implies price cap regulation where only  $C^*$  matters

$\beta = 0$  implies cost plus price control, where only  $C$  matters.

Another form of price control, called sliding scale regulation, is where an intermediate value of  $\beta$  is determined in advance and some part, but not all, of a change in costs is passed on to consumers.

In general terms, according to this framework:

- the higher is  $\beta$ , the greater the incentive to cut costs
- the lower is  $\beta$ , the greater is the pass-through of any change in costs. When the regulator sets prices, actual costs cannot be known with certainty and the value of  $C$  (like that of  $C^*$ ) is an expected value. However, there are important differences between  $C$  and  $C^*$ : the former is estimated from actual recorded costs (a backward-looking approach) and changes in costs are passed on to consumers (perhaps with a lag, as discussed below). The latter ( $C^*$ ) is derived from a forward-looking method, either a 'building block approach' related to the firm's own costs and to assessments of potential productivity growth or the application of yardstick competition, that is, an assessment based on costs of comparable firms.

## Price Cap Versus Rate of Return Regulation

The problem is then to choose the value of  $\beta$ . It does not have to be either zero or 1 but can take an intermediate value. Changes in the value of  $\beta$  affect a number of indicators of performance of the regulatory process, identified by Kirkpatrick and Parker (2004). These include the following:

- Incentives for efficiency increase with the level of  $\beta$ , since the benefits of efficiency gains are retained by the firm until the next price review.

- The risk of political rejection increases with  $\beta$ , since slight errors in setting the cap lead either to large profits for the regulated firm, or to bankruptcy. As Ergas (2004) puts it, the price cap decouples price and cost outcomes, which is 'only plausible when errors are not likely to be significant'.
- The risk of regulatory gaming decreases with  $\beta$ . This risk refers to the problem of withholding the correct information or inflating cost figures, which can be significant under rate of return regulation. Price reviews can be used to correct this problem (although higher frequency of reviews may also increase the risk of capture of the regulatory process). Under price cap regulation, the firm has less incentive to withhold information.
- The threat of regulatory capture increases with  $\beta$ , since high values lead to either very high profits or negative profits where circumstances change quickly. Consumer interests (in the former case) or producer interests (in the latter) have a greater incentive to lobby regulators to change prices. Where the political institutions are not sufficiently robust to resist this pressure, the regime would shift and its legitimacy would be undermined. The parties would also be encouraged to play this regulatory game. As noted again below, the cost of capital could also increase. Ergas (2004) observes that, as the price cap removes a link between prices and actual costs, it also removes a constraint on the regulatory process and increases the risk of 'regulatory opportunism'.

The relationship between changes in the value of  $\beta$  and the costs of administration is not so clear. The difficulty of administration may increase with  $\beta$ , since setting the price cap requires methods of analysis that may exceed the capacity of the regulatory office. Incentives to withhold information are, however, higher under the rate of return regime, so the challenges of collecting and auditing data may be greater under that regime. Some types of administrative resources have relatively high opportunity costs in developing countries (Domah, Pollitt and Stern, 2002).

Overall, the choice of  $\beta$ 's value hinges on an assessment of:

- (a) the efficiency effects;
- (b) risks in the regulatory process; and
- (c) administrative costs.

Further guidance on this choice is available from empirical work on the effects of regulation.

Guasch, Laffont and Straub (2003:34) draw on their review of actual contracts to argue for the rate of return 'as the salient choice'. Price caps in their sample increased the likelihood of renegotiation: firms appeared in fact to bear little risk, since they 'kept the efficiency gains when business was good and renegotiated when it was poor'. Gains were generally not shared with users. Price caps also increased the cost of capital. Price caps tended to reduce investment,

since its rewards were not available until a later date. The renegotiation process tended to turn the price caps into hybrid schemes.

Kirkpatrick and Parker (2004) in their review of the impacts of methods of regulation conclude that, while price caps have improved performance in developed economies, they are more difficult to apply in developing economies. They suggest that an intermediate value of  $\beta$  — that is, the sliding-scale approach to price setting — is the best solution, and may add credibility to a regulatory system in which changes in prices or profits are greater than expected.

A true sliding-scale system has to be adopted in advance and designed to operate automatically. For example, once a firm's profit reached a certain level, further increases in profits would be removed by price reductions (see Turvey, 1995). As noted already, some regulatory arrangements tend to converge on a form of regulation with these characteristics; their design might have been as a price cap but their implementation is closer to that associated with an intermediate value of  $\beta$ .

### **Regulatory Periods**

Rate of return regulation reduces the incentive to cut costs. According to Ergas and Small, (2001:8):

Provided full cost recovery is guaranteed, neither shareholders nor managers gain any advantage from streamlining production processes or investing in more efficient technologies'

A longer regulatory period helps avoid this problem. When the period is lengthened, the regulated firm has an incentive to cut costs early in the period, since it retains the benefits of doing so.

The finite length of the regulatory period is a problem for incentive regulation. As Ergas and Small (2001) explain, the regulator generally sets an initial price level and then requires that prices fall in real terms by a percentage  $X$  each year until the next review. Both the initial level of prices and the  $X$  factor would be set on the basis of the firm's own history and circumstances, but can be influenced by various systems for benchmarking that performance. A finite length of the review period is required, since if an error is made in the  $X$  value then the arrangement is not likely to be sustainable. The problem is that, as the review date approaches, the firm has an incentive to work less hard to reduce costs, because, if it can convince the regulator that the scope for further productivity gains is small, it may be rewarded with a smaller  $X$  (see Ergas and Small 2001).

One solution is to adopt a carryover mechanism so the firm is allowed to charge higher prices than otherwise for a longer period, to recoup a cost-reducing investment. However, as Ergas and Small (2001) point out, the incentives created depend on the length of the regulatory period.

## **Service Quality**

Incentive regulation encourages firms to cut costs, but the reductions could be the result of improvements in productivity, or reductions in quality — when costs are reimbursed, the latter is less of a problem (see Ergas and Small, 2001). A variety of methods is used to give attention to service quality. One option is to impose minimum standards on suppliers, with penalties or compensation to be paid if these are not met. Another is to endorse a range of prices depending on the quality of service produced.

On what grounds does the regulator choose the minimum quality standards or confront the firm with a trade-off between price and quality? This problem becomes more important as the regulatory process becomes more intrusive.

Ideally, the regulator's choices will reflect the views of the service's consumers, but in practice these are difficult to establish. Many regulatory agencies are now seeking evidence from firms of formal consumer codes or customer consultation systems, and some are allowing firms to propose different business plans depending on the information that comes from these consultations.

Even better is to establish regulatory processes that permit direct contact between the demand and supply sides of the market. This is possible when consumers are large and sophisticated (leading to a case for private contracting) but more difficult when many small consumers are involved. One response is to look for ways to introduce retail competition so that retailers act as the agents for consumers in negotiating price and quality packages with the upstream suppliers. The introduction of larger buyers on the demand side ameliorates one of the constraints on the use of contracts.

This approach of seeking direct links with the demand side of the market places more weight on the role of a complementary agency with responsibility for competition policy in this sector (for example, giving attention to mergers among, or forms of uncompetitive behaviour by, the supplier group). Attention to these competition policy issues is important even in the presence of an economic regulator — its work helps reduce the regulator's workload, allowing that regulator to specialise in matters of price control.

## **Conclusion**

With so many issues to resolve it is not surprising that promoting private participation has been difficult, and more so than once expected. The issues include:

- the separation of the provision of upstream and downstream activities around the bottleneck facility;

- the means of dealing with the high likelihood that contracts will be incomplete, and the design of the regulatory agency;
- the political support for linking prices to costs when the contract design requires the provider to supply services and collect revenue to cover costs; and
- the choice of an appropriate point in the broad trade-off between cost price and price cap regulation, including the design of complementary institutions, and other related regulatory practices such as the length of the regulatory period and service standards.

There is no one solution to the question of how best to engage the private sector. Options vary depending on the allocation of responsibilities for asset ownership, management oversight and the provision of services. The choice depends on the nature of the service to be provided and the stage of development of the host economy. Some forms of private sector participation demand high levels of regulatory capacity and political support for reform. In economies where those conditions are not met, intermediate forms of private participation are preferable.

As institutional capacity develops, more elaborate or extensive forms of private participation can be adopted. One form of engagement of the private sector may not be appropriate for long periods. Some adjustments will be valuable and it is important to establish common understandings in the community and among investors about the likely trajectory of that change.

The regulatory institutions should also be open to evolution and reform over time. Price caps have some considerable advantages and create powerful incentives for improved performance. But they are also risky and prone to political collapse. Cost-based regulation is a safer choice when complementary institutions to reduce the risk of capture of the regulatory process are not available. The downsides of that choice are the lack of incentive for productivity growth and its information problems. As development proceeds and experience accumulates, the system might be shifted towards a price cap.

There is value in further empirical work in two main areas. One is about the processes of contract renegotiation. This work would examine questions such as:

- the links between the probability of renegotiation and the presence of an independent regulatory body;
- the choice of price-control method;
- the general conditions of governance in the host economy;
- the degree to which prices cover costs; and
- the nature of the service provided.

Case studies of ways to limit the moral hazard associated with contract renegotiation would also be valuable. The other area of empirical work is to study

the effects of various regulatory processes (characterised in more detail than previous work has been able to do) on performance in regulated markets, including cost reductions and productivity growth, as well as service quality changes and innovation.

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