

Price Regulation of Utilities

This article examines the current economic thinking on prices regulation of utilities. In particular, the article reviews the major options available for regulating utilities in order to gain a better understanding of regulatory best practice in this area.

INTRODUCTION

While reforms in utility industries such as those facilitated by national competition policy have encouraged competition, the continued existence of monopoly power in parts of those industries has left a residual need for some form of prices regulation. Infrastructure industries such as telecommunications and electricity are examples where there can be such a residual need for regulation. With regulation now very much focused on pricing of key bottleneck facilities, the success of prices regulation will be an important determinant of investment in infrastructure sectors, with implications for economic growth more generally.

In utility industries, the preferred form of prices regulation in Australia is the CPI-X regime, and this is an increasingly popular form of regulation around the world. The purpose of this paper is to review the current thinking on prices regulation and to draw some conclusions about regulatory best practice in this area.

As the current thinking on prices regulation in the literature has evolved, attention has focused on two fundamental questions:

- First, when is regulation required and justified?
- Second, once justified, how should the enterprise or activity be regulated?

This article focuses primarily on the second question, but also looks briefly at the first question.

WHEN TO REGULATE?

In most countries, the public sector has played a substantial role in the functioning of the economy in recent history. For example, in 1984 the average share of public expenditures in GNP in the (then) ten Member countries of the European Community was close to 50 per cent. Historically, the extensive involvement of the public sector in world economies has been justified for a wide variety of reasons including raising revenue, promoting technical progress or development, public interest, national importance, national security, market

failure, ensuring adequate provision of merit and public goods, and distributional objectives.

In recent times, the case for public sector involvement in the economy has come under strong scrutiny, particularly from the 'Chicago School' of economics.

The major focus of the Chicago School criticisms has been the issue of regulatory failure.¹ It was argued that the regulation put in place to overcome alleged market failure was often ill-directed and resulted in a range of inefficiencies that could be worse than the failures they were intended to correct.

In response to these criticisms by the Chicago School an extensive debate has ensued in the economic literature in respect of utility regulation. More than was the case previously, this debate has focused the attention of economists on issues of market failure as the primary justification for the regulation of utilities.

Market and regulatory failure

The theory of market failure points to situations in which preserving or increasing competition may not be enough to promote good economic performance. Perhaps the key market failure issue faced in utility industries is that of natural monopoly. In industries that are characterised by natural monopoly it is cheaper to produce goods by a monopoly than by an additional firm owing to the presence of economies of scale. Regulation is intended to permit these economies of scale to be exploited while at the same time preventing adverse monopoly behaviour.²

In assessing the need for regulation, market failure must be balanced against regulatory failure.

To date, the debate in the literature has not provided a universal view on the appropriate balance between market and regulatory failures. Key factors such as the characteristics of the industry and the type of regulation selected can interact to produce significantly different outcomes in different circumstances. Consequently, each case must be examined on an individual basis in order to determine the appropriate level of regulation.

The market failure test proposed by Spulber provides a useful framework in which to make this assessment.³

1 Regulatory failures cited in the literature include regulatory capture, perverse incentives, sovereign or inter-temporal risk, information asymmetries, unclear or mixed objectives and multiple regulators.

2 A range of other market failure issues are identified in the literature including economic complementarity, merit goods, public goods, stabilization of cobweb markets, externalities, transaction costs and information asymmetries.

3 Spulber, Daniel F, 1989, *Regulation and Markets*, MIT Press, Cambridge Massachusetts, p. 3.

The test has essentially three steps. It must first be established that market failure has occurred. ... The second step of the test is to determine whether government regulation can alleviate the misallocation of resources or correct the cause of the market failure particularly when faced with similar institutional, technological, or informational constraints. Finally, it must be shown that the potential benefits of regulatory remedies justify market intervention with any attendant administrative costs and induced allocative inefficiencies.

HOW TO REGULATE?

Once the case for regulation has been made there is a substantial menu of options from which to choose. A useful framework in which to examine these options is the five general forms of utility regulation identified by Berg:⁴

- Cost of service regulation (including direct price setting and rate of return).
- Price cap regulation.
- Performance based regulation.
- Franchise regulation.
- Yardstick regulation.

Cost of service regulation

Essentially, cost of service regulation can be divided into two broad categories, direct price setting and rate of return regulation. While cost of service regulation has tended to become less favoured in recent years, it continues to play an important role in the Australian regulatory environment. For example, Telstra and Australia Post are in effect subject to directed prices for local calls, calls from payphones and stamps. In a similar vein, should access to various aspects of the Telstra network proceed to arbitration, the Australian Competition and Consumer Commission (ACCC) may be required to set telecommunications access prices (although not at the retail level). Also, rate of return regulation is being used in the Victorian gas industry in order to establish reference tariffs for access to gas networks that will subsequently be subject to price caps.

4 Berg, Sanford V., 1997, 'Introduction to the fundamentals of incentive regulation', in Australian Competition and Consumer Commission and Public Utility Research Centre (eds.) (1997), *Infrastructure Regulation and Market Reform: Principles and Practice*. Selected papers prepared for The Utility Regulation Training Program, held in November 1997 in Melbourne, Australia.

Direct price setting

Perhaps the most intrusive form of regulation occurs when the government takes an active role in setting the prices that can be charged. This can take place in a number of contexts. For example, the utility can be operated as a government department as was the case with the Postmaster General's Department in Australia until the 1970s, or through an agency or commission as has been the case with many United States utilities.

In recent times, the price setting model of regulation has come under strong criticism in the literature. A major focus of this criticism has been the lack of clear objectives (or the presence of competing objectives) established for the rate setting body.

While it is the case that the role of the government department or utility commission is to act as a market surrogate and set price, that task is performed in a political and social context. Consequently, while the economic criterion of efficiency is an input to the rate making process, it is balanced against a range of other objectives. Therefore, there may be significant pressure for the regulator to suppress economically efficient pricing structures.

A second major criticism of price setting (and a major theme in the literature) is the principal-agent problem. This problem has two dimensions. First, the regulated enterprise (the agent) is likely to be subject to different incentives and motivations than the government (the principal). Consequently, the agent may pursue the objectives set for it in a manner that is contrary to the anticipation of the principal. Second, the agent will usually possess substantially more information about its customers, costs and market conditions than the principal. This information asymmetry can be used to the advantage of the agent in order to manipulate outcomes to its advantage.

The conclusion from the principal-agent debate is that the outcomes of regulation can be very different to what was intended by the government. In such an environment, prices set by the regulator may result in a range of unintended consequences and inefficiencies.

Box 1: Reform of electricity pricing

Prior to market reforms commencing in the early 1990s, governments played a key role in price setting for publicly owned electricity authorities. For example, in Victoria and Tasmania where electricity authorities had the power to set their tariffs, these tariffs were required to be approved, or could be adjusted by government. In NSW, the responsible Minister would determine prices for the electricity authority following recommendations from a public inquiry.

As electricity prices were determined independently from the costs of production, electricity authorities had few incentives to pursue least cost methods of generation.

Following the introduction of electricity market reforms there has been a move away from government involvement in price setting, although arrangements still vary between jurisdictions. In the case of jurisdictions participating in the National Electricity Market, final electricity prices for customers who can choose their electricity supplier are not regulated. The generated price of electricity is unregulated, and is determined through the electricity pool on the basis of competitive bids for dispatch. There have been substantial price falls under this regulatory model. The transportation component (that is, transmission and distribution) is still subject to regulation owing to the natural monopoly characteristics of these systems, but price caps and/or cost of service regulation has been adopted in preference to direct price setting.

Rate of return regulation

The process of rate of return regulation can be divided into three basic steps:

- (1) The firm's costs are reviewed, and costs deemed to be unnecessary are eliminated.
- (2) A rate of return judged to be fair for the firm is specified.
- (3) Prices and their structure are set to generate enough revenue to cover costs and provide a fair rate of return.

The key property of rate of return regulation is that it permits the regulator to limit the profit level that can be achieved. Restraining profits by fixing the maximum return on investment (in real terms) provides the enterprise with a degree of autonomy in conducting its affairs while limiting monopoly behaviour.

As with direct price setting, the literature identifies significant problems with rate of return regulation. These include:

- *Allowable costs.* Problems in determining allowable costs arise because the regulated firm typically is charging a price below the profit maximising level and has the ability to raise prices and cover the costs without lowering profit. Consequently, the firm may have an incentive to exaggerate its costs or incur costs that are not necessarily in the best interests of consumers. Two costs that have been the subject of litigation in the United States are advertisements that are intended to promote company image and charitable contributions also meant to provide goodwill. Similar issues arise with R&D expenses.
- *Depreciation expense.* Depreciation can be a real cost in the sense that it represents wear and tear on capital and therefore should be included as an allowable expense. However, depreciation can also reflect economic obsolescence due to poor investment decisions. Further, the selection of an appropriate depreciation schedule can be highly subjective.
- *Incentives.* There is very little incentive for a firm to hold down its operating costs if they can be passed on to the consumer. For example, the regulated firm may not have a strong incentive to seek out the least cost method of production or to bargain with a union over wages. Effective monitoring of the firm's effort in reducing costs is virtually impossible short of duplicating the firm's managerial functions. Firms subject to rate of return have been hypothesised to operate with too much capital for the output being produced since the cost of the artificially high capital base can be passed on to consumers (the Averch-Johnson effect).
- *The rate base and allowed return.* The firm's capital stock, or rate base, is instrumental in determining the firm's profit. However, there is no clear guideline on how the rate base should be measured. For example, should the capital stock be measured based on the original cost of the capital, its market value, its replacement (present) cost or some other measure? Each measure can yield significantly different results.
- *Regulatory capture.* It may be the case that the regulatory agency has preferences that unduly reflect the benefits obtained either by consumers or firms in the regulated market. This may affect the balance between public interest and firm interest.

Box 2: Rate of return in the Victorian gas industry

The rate of return exercise recently undertaken by the ACCC and the Victorian Office of the Regulator General (ORG) illustrates some of the difficulties discussed above.

Responsibility for Victorian gas pipelines is split, with the ACCC having responsibility for transmission pipelines (the long haulage of gas from the gas producer) and the ORG having responsibility for the distribution network (the reticulation of gas to households and businesses).

The chosen regulatory scheme is a hybrid model that uses rate of return to establish initial prices for access to the network and then reverts to a price cap regime over the regulatory period.

The media release issued by the ACCC⁵ announcing its final decision highlighted a range of difficulties encountered in undertaking the process including:

Initial asset valuation. In forming a view on the valuation of the initial capital base the ACCC had to take account of replacement costs, inflation, depreciation, new capital expenditure and redundant assets.

Appropriate weighted average cost of capital (WACC). The WACC initially proposed by the ACCC was subject to criticism. Business users and consumer groups argued that the figure was a little high, while the view of the utilities affected was that it was much too low. The ACCC's draft position was also criticised because some parties believed it did not provide adequate investment incentives.

Price cap regulation

Price cap regulation, as an alternative to traditional rate of return regulation, developed as a practical regulatory tool in the early 1980s in Britain. In 1983, the newly privatised British Telecom was regulated by price caps after the recommendations of a report by Stephen Littlechild. In his report, Littlechild argued that price cap regulation would provide desirable incentives to achieve and improve productive efficiency, while reducing the information burden of regulation. He argued that unlike rate of return regulation, price caps do not require imprecise and often arbitrary measures of a rate base or return on capital and eliminate the need to allocate costs when only some parts of a firm are regulated. He also argued that the simplicity of price caps would reduce the likelihood of regulatory capture.

5 Australian Competition and Consumer Commission, 1998, *ACCC and O.R.G. release Victorian gas decisions*, Media Release MR179/98, Canberra, ACCC, 6 October 1998.

In its simplest form a price cap simply sets a maximum allowed inter-temporal path for the price of a specific product. The rules for the path are set in advance. For example, the price of a specific product in any given year may be capped at a level that alters over time in response to a price index that is exogenous to the regulated firm and a factor (X) set in advance by the relevant regulator. The maximum price then rises in line with the main index of retail prices (the CPI in Australia) but falls at a rate X set in advance.

The value of X is meant to reflect potential cost savings by the firm due to either increased efficiency or technological progress. The X factor enables these cost savings to be shared with consumers without adversely affecting the incentives of the firm to achieve these savings. The X factor is set to reflect expected firm productivity improvements in excess of those expected for the general economy and expected changes in input prices for the regulated firm that differ from the general economy wide rate of price change.

Overall, the view in the literature is that the experience with price cap regulation has generally been a success. Price caps offer a better alternative than the more traditional forms of regulation, and owing to the incentives that they foster, price caps have the potential to yield better outcomes in terms of economic efficiency while requiring relatively minimal regulatory effort.

However, the literature observes that the desirable properties of price caps can be eroded due to poor implementation. By heeding the lessons about the implementation of price caps outlined in the literature, the positive attributes of this scheme can be protected. Important lessons include:

- *Choosing the correct value of X.* In practice, it can be difficult to choose the correct value of X. If X is set too high, the firm will not be able to cover its costs, but if X is set too low then the firm will earn supernormal profits and prices will remain excessive. Ideally, the value of X will be based on expected future productivity improvements, however, this determination involves a degree of subjectivity. Exceptional firm performance has raised difficulties in some cases. For example, the electricity regulator in the UK reneged on the previous announced price cap in 1995 owing to high profit potential. Also, the newly elected Labour government in the UK introduced a 'windfall' tax on regulated utilities justified on the basis of excess profits earned by these companies.
- *Setting X based on past performance.* If the regulator uses the past performance of the firm, such as profitability, as a guide to setting the X factor then management incentives will be undermined and the price cap will take on the characteristics of rate of return regulation. This effect will be more pronounced if reviews of the X factor are undertaken at short intervals.
- *Level of the initial price base.* The effectiveness of price cap regimes can be undermined if the initial price base significantly diverges from efficient

prices. Even after years of operating under a price cap, a firm may still be well below world's best practice if initial adjustments were not made.

- *Breadth of the price cap bundle.* The bundle of products included in the price cap basket must be carefully designed. If the bundle is too broad then the firm may use its freedom under the cap for anti-competitive purposes, but if the basket is too narrow then opportunities to rebalance prices for both consumer and firm gains will be limited.
- *Quality standards.* Price caps should not be used in an environment that is independent of service quality and infrastructure development. For example, the firm may maintain its profits under the price cap by reducing the quality of the product it sells to consumers.

Performance based regulation

Performance based regulation (PBR) is the first of three relatively novel schemes examined in this article. Under PBR, performance measures are used to motivate the firm. Generally, this involves linking the profits of the firm (or employee remuneration) to performance measures in such a way that the firm's profits are permitted to increase if it achieves certain performance standards. In this manner, the firm has an incentive to seek out cost efficiencies and to improve customer services so that it will be permitted to achieve higher returns.

An interesting example of PBR cited in the literature is sliding scale regulation used in the gas industry in England back as far as 1855. Under the scheme the gas firms were permitted to pay dividends that were inversely proportional to the price of gas. As gas prices fell the firm's owners would be able to accrue higher and higher dividends.

Another PBR scheme is the 'basic' scheme in which surplus profits are split between shareholders and employees. By permitting the firm's owners and employees to retain returns from introduced efficiencies, these players have an incentive to increase firm efficiency. A modification of the scheme can also return some of the surplus profits to consumers.

A third scheme is the output floor scheme. Under an output floor, the regulated enterprise has substantial freedom as long as it meets the minimum level of production set by the regulator. The firm may set any prices, any mix of inputs and earn any level of profit it chooses, provided that it meets the output floor. However, provided that the output floor has been set correctly, it is highly likely that the firm will be required to reduce its overall price level in order to stimulate sufficient demand to meet the output floor.

Difficulties can arise in implementing such schemes. For example, it may be difficult to find easily defined objective performance measures that can be controlled by the firm. Also, the firm may have an incentive to achieve a target at very high costs, which can then be passed on to consumers.

Box 3: PBR in American railroads

A variation on performance based regulation is to include incentives based on quality of service. As an example of the style of regulation that could be implemented Berg & Tschirhart⁶ cite the contract between Amtrak and the Pennsylvania Central Railroad in 1973. Amtrak purchased services from major railroads (such as Penn Central) and then sold the service to consumers. The existing contract between Penn Central and Amtrak was based on Penn Central's marginal cost of providing the passenger services.

Penn Central was unhappy with this arrangement because if it were to receive only marginal cost from all services, a deficit would ensue. Amtrak was also unhappy with the arrangement because it had to pay Penn Central's marginal cost irrespective of the quality of the service it was supplied. Penn Central wanted the fully distributed costs of providing passenger services to Amtrak covered rather than the marginal cost only. Amtrak countered by proposing that prices should be dependent on the quality of service.

The final contract provided for Penn Central to enjoy positive profit if quality was outstanding, where quality standards were set in respect of punctuality, comfort and the proportion of time each piece of rolling stock was available for service. Any cost savings made by Penn Central could be kept by the railroad. Punctuality was relatively easy to measure objectively. Comfort bonuses were based on the number of times the cars were cleaned.

Yardstick regulation

The development of international performance measures offers a way of indirectly introducing competitive pressures to infrastructure industries by comparing actual performance with international benchmarks. By providing a means of comparing performance between similar infrastructure enterprises in different regions, states, or in different countries, efficiency measurement can promote attainment of best practice.

A number of basic approaches are available for yardstick regulation including setting target levels, comparing a time-series of the organisation's performance, comparing the performance of business units within the organisation and comparisons with external agencies. As an example, comparisons between similar business units within the enterprise can act as a useful incentive

6 Berg, Sanford V. & Tschirhart, John, 1988, *Natural Monopoly Regulation: Principles and Practice*, Cambridge University Press, Cambridge.

mechanism and introduce a competitive element where external competition is absent. If linked to a performance appraisal or performance pay system, such comparisons can act as a valuable tool in improving overall firm performance.

Within these basic frameworks, the next step involves selecting appropriate performance measures. For infrastructure industries performance measures are generally divided into three broad categories: accounting, non-financial and economic indicators.

The principal criteria for choosing a set of performance measures is that they be comprehensible, comprehensive, useable and timely. For the performance measures to be comprehensible they must be few in number, but they must nevertheless provide an overall indication of the performance of the firm. A large number of technical measures may in total provide a comprehensive overview of the firm but may be difficult to interpret, especially if some indicators move in opposite directions.

As with price cap regulation, care must be taken in the implementation of yardstick regulation. Attempts at yardstick regulation are almost always criticised by the regulated firm on the basis of 'special circumstances' that render its comparison with other firms as inappropriate. While these criticisms are generally driven by self-interest, it is clearly the case that care should be taken when comparing two enterprises. Even elaborate and complex comparisons will be unlikely to fairly compare two enterprises across all circumstances. Consequently, a degree of subjectivity must be employed when implementing yardstick regulation.

Defining objective performance measures can provide a challenge for the regulator, especially when the provision of services is the subject of the study.

On occasion, perverse incentives can arise if all activities of the enterprise are not included in the comparison. For example, if telecommunications companies are compared on the basis of the time it takes them to correct faults and not the number of faults encountered, the firms may allocate staff to correcting the faults but not preventing them.

Despite these qualifications, yardstick regulation can provide some important insights into the performance of the firm. In particular, international comparisons can provide a useful measure of how the firm is performing compared with similar organisations overseas. Yardstick regulation may be most effective when used in combination with other types of regulation or used as a guide in setting the X factor for price cap regulation.

Franchise regulation

The French water utilities provide an example of franchise regulation. In this example, the municipality retains responsibility for financing and commissioning new investment while the lease company is usually responsible for operations, accounts and so on, as well as renewal investment. The winning

company contracts with the municipality to supply water to all corners at a certain indexed price and at a recognised quality standard. Under these contracts it is common for the contract holder to recommend new investment required for the system.

The principle behind franchising is that the government (as the representative of consumers) can award to one firm an exclusive right to produce and sell a particular good in a particular market. The firm that receives the right or franchise is one of many bidders that compete for the franchise by offering to sell the good to consumers at a specified price. The bidder offering the best price-quality package is awarded the franchise. If collusion does not occur between the bidders then competition between them should drive price down towards average cost.

By allocating one firm exclusive rights, it is expected that the firm should be able to exploit any natural monopoly economies present.

As with the other regulatory schemes, franchise regulation gives rise to some difficulties in practice. These include complexities in determining the winning bidder, setting an appropriate term for the length of the contract and attracting new bidders at the contract renewal stage.

Nevertheless, these difficulties are encountered frequently in the economy. For example, similar issues must be addressed whenever contracts are awarded. Consequently, with careful management these issues should be able to be addressed.

Hybrid schemes

In addition to the general schemes discussed above, another regulatory option is to make modifications to the general schemes or to combine elements from different schemes. In Australia in recent years there have been a few examples where modifications have been made to the basic schemes. Among these are the airport price caps that include a quality monitoring element; and the proposed sale of franchise rights for Victorian public transport which will also have quality guarantees imposed.

An example of a hybrid scheme is the Victorian gas regime discussed earlier which uses rate of return to set initial prices and then a price cap into the future.

The objective of hybrid schemes is to offset the weaknesses of one scheme with some of the strengths of others. This approach can increase the complexity of the regulatory scheme and so an assessment must be made of whether the gains in the effectiveness of the scheme outweigh the increased regulatory costs.

Overall, hybrid regulatory schemes offer the potential for significant improvements in regulatory effectiveness and should therefore be examined when designing systems.

CONCLUSION

Significant elements of many utility industries exhibit natural monopoly characteristics such that unregulated producers may have substantial potential to exploit market power and raise prices. Consequently, a case may be made for government involvement to protect the interests of consumers and to ensure that higher levels of output growth are achieved.

There is also substantial political and social pressure for government regulation. This pressure arises because of concerns that unregulated utilities may not adequately guarantee security, stability and safety of supply and also may impose 'unfair' pricing on customers that have little bargaining power.

However, there is a counterpart to this demand for regulation. Utility industries are capital intensive and their assets are durable, long-lived and immovable. Demands for access and 'fair' or 'non-exploitative' prices mean that investors might expect that after they have sunk their capital they would be limited in the prices they can charge and be subjected to possibly onerous obligations to supply. Therefore, the incentive to invest depends critically on expectations of the future pricing policy and must be considered by the regulator.

Consequently, there is a need to balance the costs of regulation against the expected benefits. A useful test for undertaking this task is that outlined earlier in this article which requires first that market failure be demonstrated, second the government through regulation must be able to do better given the similar constraints faced by the private sector and third the benefits from regulation must be greater than its costs.

Having justified the need for regulation, attention then turns to the appropriate type of regulation. Five broad categories of regulation have been discussed in this article. While the effectiveness of each type of regulation will vary depending on the circumstances, there is a clear preference in the literature for incentive type regulation. In particular, the literature speaks positively of price cap regulation which offers a better alternative than the more traditional forms of regulation, and owing to the incentives that are fostered, price caps have the potential to yield better outcomes in terms of economic efficiency while requiring relatively minimal regulatory effort.

However, the literature observes that the desirable properties of price caps may be eroded due to poor implementation. By heeding the lessons about the implementation of price caps outlined in the literature, the positive attributes of this scheme can be protected.

Finally, hybrid schemes offer an interesting alternative to the five basic schemes. By combining schemes, the negative aspects of the various schemes can be offset by the positive aspects of others. Such hybrid schemes should be given greater consideration in regulatory design in the future.