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Regulation of the private provision of public water-related services *

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Summary

Since the 1970's, the governments of the region have been transferring, in one form or another, public companies and other state institutions to the private sector. Privatization has now extended to all sectors of the economy, including water-related public utilities. Private sector involvement in the provision of water-related goods and services offers potentially significant efficiency gains. It will not, in itself, guarantee lasting welfare improvement unless, there is a competitive market. If not, results will depend on the regime of regulation in which the industries operate. The effectiveness of this regime is determined by the ability of governments to find and create adequate institutional and regulatory conditions that oblige supplies of water-related goods and services to be efficient and responsive to the needs of their customers. Monopoly regulation includes structure regulation, which determines which organizations or types of organizations can engage in which activities, and conduct or behavioral regulation, which concerns the permitted behaviour of organizations in their chosen activities.

This paper outlines the principles believed to be essential in formulating an adequate regulatory framework for the water sector. Its focus is on the issues to be confronted in developing a regulatory structure for water-related public utilities. It reviews a vast body of recent literature on economic regulation and private sector participation in the provision of water-related goods and services as well as the experience of the countries where privatization and regulatory reforms have advanced most. Emphasis is given to the regulation of prices, product and service quality, investments and quantity. The alternative means of overcoming the problems of asymmetric information between regulator and regulated firms, the limited commitment powers of governments and regulators, conflicts between regulators with different mandates, government failure and regulatory capture are also discussed, as are the possibilities of introducing competition and facilitating regulation through changes in the industrial structure, including horizontal and vertical restructuring.

The paper is the second of a series of studies on the privatization issue in water resource management. The focus of the first paper of the series - "***Private participation in the provision of water services. Volume I. Alternative means for private participation in the provision of water services***" (LC/R. 1576, 8 September 1995) - is on the alternatives available for the privatization of water-related services and the experience of governments with these different alternatives. Considerable emphasis is given to the number and variety of alternatives available for structuring private sector participation in the provision of water-related services and for institutional reform in the public sector. Other papers provide a country-by-country guide to current policy, with examples of actual cases of privatization, and discuss more directly the economic theory behind the policy alternatives for defining roles of the public and private sectors in the management of water resources and the provision of water-related goods and services.

Introduction

Historically, many water-related services were provided through the private sector, especially electricity generation, but, commonly, both drinking water supply and irrigation. Until the late 1950's, the power sector in most Latin American and Caribbean countries was privately owned (Santos, 1993); prior to 1950, it was not uncommon to see private provision of drinking water supply and sanitation services (Richard and Triche, 1994); and the private sector has always maintained an important role in the development of irrigation in most countries (UN/ECLAC, 1994a). The direct involvement of the public sector, other than municipalities, in the operation of water-related infrastructure is a relatively recent phenomenon. It is only this century, and since the 1920's, that governments decided that water-related services should be provided by the public sector and only since the 1940's that such services should normally be provided by agencies of the central government rather than by states or municipalities (Lee, 1990). The reasons for this expansion of the public sector into the provision of water-related services are complex, but basically arose from the decision of governments and international institutions that decisive government intervention in the economy was required to maximize economic welfare through economic growth.

Since the 1970's, however, opinion has begun to change to place emphasis on maximizing the role of the private sector. Again, the reasons advanced are varied. The basic reason is, however, a change in ideology and it is now accepted that the private provision of productive services is the more effective tool for bettering economic welfare. As a result, since the 1970's, and beginning in Chile, the governments of Latin America and the Caribbean have been transferring, in one form or another, many public companies and other state institutions to the private sector. Such transfers have been especially marked in manufacturing and other directly productive activities, but privatization has extended now to almost all sectors of the economy, including the provision of most water-related services. There are now numerous examples in Latin America and the Caribbean of the successful incorporation of the private sector into different water-related services in a great variety of ways.

Private sector involvement in the water sector offers potentially significant efficiency gains but does not in itself guarantee lasting welfare improvement. Unless, there is a competitive market, results will depend on the ability of governments to find adequate institutional and regulatory solutions to the provision of water-related

services by the private sector. Given that the transfer of the responsibility for the provision of water-related goods and services and their management to the private sector has formed and will continue to form in many Latin American and Caribbean countries an important part of the privatization process, it is important to identify those features which contribute to its success or failure in improving welfare.

Economic theory presents convincing evidence that under specific conditions competition, where it can be achieved, is a very powerful and effective force which directs privately motivated actions to socially desirable outcomes - i.e. it gives firms good dynamic incentives to reduce costs and increase efficiency, to improve the price/quality combination they offer to consumers, to innovate and to introduce new products and services - and ensures that markets automatically achieve economic efficiency and maximize social welfare. Overall, available evidence supports this conclusion and suggests that privatization of industries operating in competitive markets free from substantial market failures generally leads to significant efficiency gains and that private ownership is preferable on efficiency grounds. In these industries, the regulation of market power is typically indirect: competition does most of the regulatory work, and the task for public policy is to see that it is not undermined, i.e. that there is no prevention, restriction or distortion of competition (Vickers, 1995).

Under certain conditions inherent in the nature of the activity, competition between alternative suppliers of a commodity or service is not possible. Many water-related services, especially the provision of drinking water supply and sewerage, tend to be natural monopolies (i.e. firms whose costs fall as output increases in the range of production relevant to the market size), where the provision of the service by a single firm results in lower costs than its provision by two or more firms, and hence competition is not possible or would entail inefficient and prohibitively costly duplication of fixed assets. In the industries characterized by large economies of scale, the free market outcome would typically involve a multi-firm industry with imperfectly competitive behaviour as well as unexploited economies of scale (Perry, 1984). There are several policy options open to governments regarding natural monopolies managed or owned by the private sector whether providing water-related services or in other areas of the economy.

Firstly, a government might decide that monopoly rents are worth accepting and do nothing. Even though this approach implies that society will sustain a welfare loss, there may be cases where this loss is worth accepting and users may prefer paying monopoly prices for a high quality service rather than going without or making do with an inferior supply. Moreover, where under-provision of services and their poor quality are the major problem, as in many Latin American and Caribbean countries, concerns about the imperfections of service provision by an unregulated

private monopoly may be of little importance compared with the existing losses from poor provision. Furthermore, losses due to monopoly pricing by unregulated private natural monopolies would be offset, at least in part, by the advantages given by size and integration.

Unregulated monopolies, however, have important drawbacks. On the one hand, where competition is not possible and consumers have no alternative sources of supply if the service is poor or the price is high, a natural monopoly, as any other monopoly either public or private, will try to maximize its profits. It does this by charging monopoly prices, and hence producing less output, or arbitrarily reducing service or product quality. Welfare losses from monopoly prices can be expected to be especially high in the case of water-related products and services because most of them are characterized by extremely low price elasticity of demand, particularly at low consumption levels (see Jones, 1994). On the other hand, the substantial market power that insulates a natural monopoly from competitive market discipline, diminishes incentives for innovation and efficiency. With no threat of competition from other firms, natural monopolies may not have the incentive to pursue cost-reducing behaviour, rather they will permit a considerable degree of slack in their operations. As Adam Smith (1776) said, "Monopoly ... is a great enemy to good management, which can never be universally established but in consequence of the free and universal competition which forces every body to have recourse to it for the sake of self-defence". Finally, the fact that in a typical natural monopoly industry, a high proportion of the total cost has to be irrevocably committed before a project becomes fully operational and begins to earn profit, while government can never make a credible commitment not to regulate in the future and there is always the risk of new entry, means that a natural monopoly will not find it in its interest to invest at the efficient level.

Secondly, a government might decide to continue the provision through a public enterprise, although this option is likely to be unattractive in the present circumstances and lead to the continuance of the problems of inefficiency, capital shortage, poor service quality, etc. which have prompted the reconsideration of such an alternative in the first place.

Thirdly, cooperatives are potentially an interesting option. There is considerable experience in Latin America and the Caribbean with cooperatives, particularly for small electricity or drinking water supply and sanitation systems. However, cooperatives seem to work best only for smaller systems in rural areas and small towns.

Finally, a government might decide, as most governments in the region now have, to transfer services to the private sector and to use whatever means at its

disposal to influence private sector behaviour. Where market failure, such as natural monopoly, occurs and is substantial in terms of the associated welfare loss and in relation to the associated government failure, intervention in the operation of the market by government would be desirable. This means that rather than owning and operating such facilities, it is the role of the government to undertake "optimal intervention" to correct for those failures and to help restore the conditions needed to achieve economic efficiency. In regulated industries, regulator acts as a substitute for the market, taking on some of the functions of competitors, attempting to provide similar incentives to improve efficiency by regulating aspects of the firm's conduct (Helm, 1994b).

Regulation and privatization have distinct advantages over public ownership in that they allow market forces to operate and government intervention to be targeted on the areas where market failures are most pronounced (Bishop, Kay and Mayer, 1995). Effective regulation requires that the precise sources of market failure are identified, isolating them and targeting regulation specifically on them. Appropriate regulatory design maximizes the benefits from removing market failures, in relation to the cost of government intervention, because the marginal benefits of regulation decline linearly as intervention increases, while costs rise exponentially (Jones, 1994).

The shift from the reliance on public ownership and bureaucratic control for the provision of water-related services to the reliance on a regulated private monopoly, completely changes the demands on the water resource management institutions and also requires a thorough reconsideration of the policies that have been adopted towards water resource management in the past. The privatization of water-related services forces a reconsideration and readjustment of the role of the state in water resource management. It demands not only that the state withdraw from many activities but, that it takes on new ones, often of a very different nature and requiring different skills and knowledge of the public sector personnel. In water resources, all the experiences show that privatization does not just stop with the transfer of assets, but requires continuing regulatory action by the public sector.

This can mean, and has meant, the restructuring of ministerial responsibilities - for example, the transfer of the supervision of drinking water supply and sanitation companies from the Ministry of Health or Public Works to Economy or Finance or an autonomous regulatory commission - in line with the new role of government in the regulation of private companies instead of their direct control thought public ownership. It can mean, and has meant, the disappearance of activities from the public sector, as private operators take over responsibilities such as, for example, investment planning when the supply of new facilities is left to be determined through competition and the market, the plant operating (dispatching)

schedules for power stations when they are decided by competitive bids rather than by a central dispatcher office, the supervision of cultivation plans for irrigation districts when the individual farmer decides on production or the determination of release schedules for reservoirs where the operators are privately-owned electricity generating companies. In the countries where state-owned enterprises have been entrusted with regulatory functions, privatization necessarily involves the reallocation of these responsibilities to an independent regulator. Keeping agencies responsible for operating functions independent of those with regulatory responsibilities is necessary to ensure consistent and unbiased administration of regulatory standards and because a service provider with regulation functions can control access to the market and deter potential competitors.

The focus of this paper is on the issues to be confronted in developing a regulatory structure for water-related public utilities. To this end, it reviews a vast body of recent literature on economic regulation and private sector participation in the provision of water-related goods and services as well as the experience of the countries where privatization and regulatory reforms have advanced most. Emphasis is given to the regulation of prices, product and service quality, quantity and investments. The alternative means of overcoming the problems of asymmetric information between regulator and regulated firms, the limited commitment powers of governments and regulators, conflicts between regulators with different mandates, government failure and regulatory capture are also discussed, as are the possibilities of introducing competition and facilitating regulation through changes in the industrial structure, including horizontal and vertical restructuring. A lengthy discussion of these aspects is justified, and of particular importance for the water-related sectors, because the development of the idea or concept of water resource management in Latin America and the Caribbean has occurred within a context where the major users of water were within the public sector and where the private sector was largely excluded from participation in management (Lee, 1990 and UN/ECLAC, 1994a).

In deciding on a policy of introducing private sector capital and management into the provision of public water-related services such as drinking water supply, sanitation, hydroelectricity generation or irrigation and drainage, governments have many options. This paper presents and analyses the variety of regulatory instruments which are available, and which are being applied in the countries where reforms have advanced most, to attract and regulate private sector participation in the provision of water-related services. It is important to note that "effective regulation is necessarily a complex business, and to pretend otherwise is likely to have damaging long-term consequences for the industries concerned. Undue simplification of the initial framework of regulation for privatized monopolies will ... very frequently lead to the emergence of much more serious difficulties in the longer term" (Vickers and Yarrow, 1988).

I. The regulation of monopolies

In industries with significant market failures, incentives for allocative and productive "efficiency depend critically on the regimes of competition and regulation in which the industries operate" (Armstrong, Cowan and Vickers, 1994). Regulation is a response to problems of market failure and monopoly regulation is such response to markets which suffer from ineffective competition and excessive market power. The aim of regulation is to correct market failures through either very specific actions, which can include measures of functional integration and separation, control of pricing and possibly investment and quality or a legal prohibition of the exercise of potential monopoly power.

Regulation is a system that allows a government to formalize and institutionalize its commitments to protect consumers and investors (Tenenbaum, 1995). Regulatory objectives usually include: (i) the promotion of allocative and productive efficiency; (ii) the minimization of informational rent (due to the asymmetry of information between regulator and firm); (iii) the avoidance of regulatory capture; and (iv) the development of credible commitment (Armstrong, Cowan and Vickers, 1994). How to reach these objectives simultaneously is one of the central questions for regulatory policy.

It is useful to distinguish two broad modes of regulation: ***structure regulation***, which determines which organizations or types of organizations can engage in which activities (e.g. merger control, market share of incumbent firms, measures of functional separation such as vertical and horizontal structure, and liberalization and entry restrictions); and ***conduct or behavioral regulation***, which concerns the permitted behaviour of organizations in their chosen activities (e.g. product price regulation, access price regulation, regulation of non-price behaviour such as policy against anti-competitive behaviour, regulation of service and product quality and environmental regulation) (Vickers, 1991). Thus, conduct regulation exercises direct control over the objectives of the regulated firm, while structure regulation exercises direct control over the structural environment of the firm, i.e. regulates the number and types of firms in the industry, but not their behaviour (Perry, 1984). The regulation of monopoly will usually require a combination of the two.

The nature of conduct regulation is largely dictated by structure regulation. In order to minimize the scope for government failure, there should be as little of conduct regulation as possible. Regulators should seek to create a reward structure which confronts firms with strong incentives that lead to socially optimum choices, rather than engage in micro-management which is not much different from the management of state-owned enterprises; there is little merit in converting a public monopoly into a heavily-regulated private monopoly. The creation of such a structure involves identifying the precise sources of market failures, using structure regulation to isolate the activities with which they are associated, and targeting conduct regulation directly on the areas where market failures are most pronounced. If structure regulation fails to achieve this end, conduct regulation may be ineffective in restraining monopoly power and may induce productive and allocative inefficiencies.

Five criteria have been proposed as a basis for comparing regulatory systems (Littlechild, 1983):

- ***Protection against monopoly***, which includes: (i) the distributional concern that may exist about the level of monopoly profits, and (ii) the economic efficiency concern that the dominant position that a monopoly enjoys in the market may allow it to become inefficient and to exploit its monopoly power, causing welfare losses (Rees and Vickers, 1995).
- ***Encouragement of efficiency and innovation***, or the dynamic aspect of economic efficiency, i.e. the incentives that the regulatory system provides for the allocation of resources to research and development, innovation, and technological change.
- ***Minimization of the burden of regulation***, since regulation is imperfect and consumes scare resources, it is important to compare different regulatory systems in terms of their need for information, i.e. how they address the problem of asymmetric information, and other resources, and their vulnerability to regulatory capture.
- ***Promotion of competition***. Since regulation is intrinsically imperfect while competition, where it can be achieved, is the best regulator, regulation should seek to encourage full and effective competition as a means to the end of achieving economic efficiency and reducing the regulatory burden.
- ***Maximization of the proceeds from privatization and prospects for the firms.***

To what extent should public authorities rely on structure or conduct regulation is an empirical problem that necessarily depends on industry-specific conditions such as the scope for new entry and competition afforded by the underlying technological and market conditions and the degree of the asymmetry of information.

At one extreme, in irrigation there are no questions of natural monopoly. Market liberalization, restructuring and reduced transportation costs can be counted on to supply the beneficial pressures of competition and of contestability which will autonomously perform a major part of the regulatory function and remove the need for most forms of industry-specific conduct regulation. Structural reform of this nature would also be the appropriate policy choice for other water-related activities which do not involve high sunk costs, produce tradable outputs with a wide range of substitutes and can be restructured to ensure effective and undistorted competition. Electric power generation, particularly in the larger countries, is a case in point, as is confirmed by the generally successful experiences of Argentina and Chile. The same considerations could also apply to some aspects of wastewater treatment and rural drinking water supply and sanitation.

At the other extreme, potential entry and competition are generally limited with current technology in the transmission and distribution activities of drinking water supply and sewerage. In this and other industries with severe natural monopoly characteristics, two or more firms usually cannot profitably coexist in the same area. Even if all barriers to entry were removed, new entry would not materialize except at the expense of productive inefficiency related to the prohibitively costly duplication of fixed assets. In industries with a high degree of natural monopoly, conduct regulation, rather than structural reform and the promotion of competition, is the appropriate policy response.

Even in the industries with severe natural monopoly characteristics where direct market competition in neither desirable nor feasible and where conduct regulation has to be relied upon, there are usually major segments where competition is both desirable and feasible. These segments comprise an artificial monopoly and the appropriate response is the application of general competition and anti-trust or anti-monopoly policies.

Structural reform and the promotion of competition is likely to be more effective, and should probably have priority over conduct regulation, in those sectors, such as electricity generation, characterized by fast changes in the underlying technological and market conditions, because change provides the very circumstances in which new entry is feasible (Beesley and Littlechild, 1989). It also renders conduct regulation less efficient because rapid change tends to increase the asymmetry of information between regulator and firm. As an industry becomes more competitive, the need for specific industry regulation will decrease. Conversely, industries where the underlying rate of change is relatively slow, such as, drinking water supply and sewerage, offer the most promising conditions for conduct regulation. Even in these industries, however, a permanently low rate of technological change cannot and should not be taken for granted.

A. Conduct regulation

The objective of conduct regulation is to determine the permitted patterns of behaviour of regulated firms in the public interest. In other words, it imposes constraints on the regulated monopolies in order to change their conduct in the interest of society.

Conduct regulation can include product price regulation, access price regulation, regulation of non-price behaviour such as policy against anti-competitive behaviour, regulation of service and product quality, quantity, investment and environmental regulation. The central question in conduct regulation is how to regulate all the relevant aspects of a firm's conduct simultaneously.

1. Price regulation

Price regulation is the cornerstone of conduct regulation. The purpose of regulating prices is to protect consumers from exploitation by monopoly providers, to protect private investors from exploitation by government and to create a macroeconomic and regulatory environment which gives an incentive to firms to invest and operate efficiently. Stated most broadly, the major issue in price regulation is how a regulatory institution can establish incentives for the regulated private firm to act so as to maximize social welfare in a situation where the firm's and society's interests usually diverge and where the information available to the regulator and the firm is asymmetrical in favour of the firm.

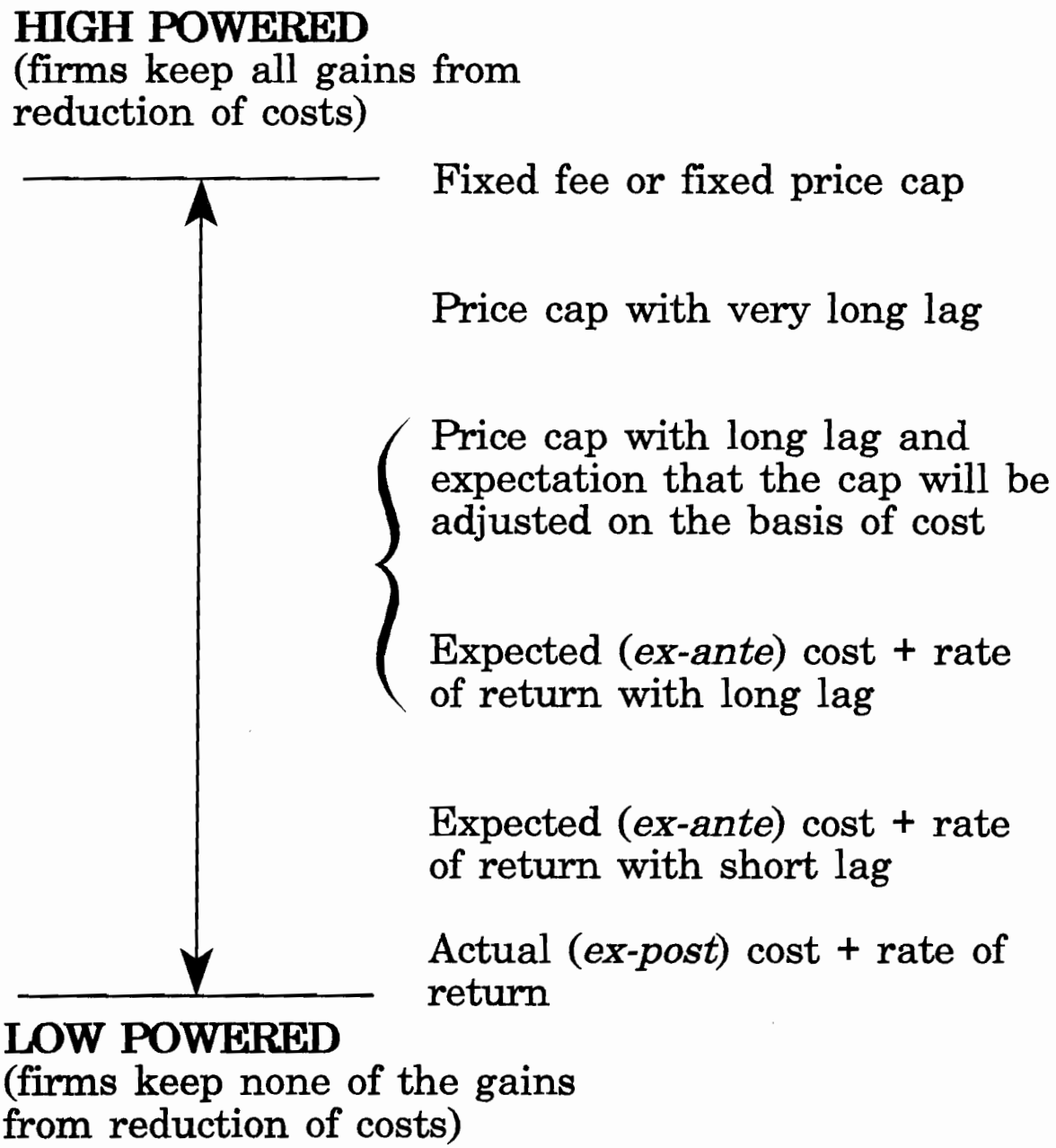
(a) The principal mechanisms of price regulation

Two principal mechanisms of price regulation are generally employed, commonly known as rate-of-return and price-cap systems. Neither is ever applied in a "pure" form. The options within the two systems really fall along a continuum between the extremes of actual costs plus a permitted rate of return, what are called *ex post* cost-plus (rate-of-return) contracts, under which a firm has no or little incentive to economize, to fixed fee (price-cap) contracts, under which a firm has full incentive to reduce costs, as it keeps all the benefits of its cost minimization behaviour (see Figure 1).

The choice of regulatory approach will depend upon the characteristics of the regulatory environment and particularly the underlying technological and market conditions. Much will depend on market structure and a country's institutional endowment (Nellis and Roger, 1994). Other relevant factors include the costs of monitoring performance, the extent of the information asymmetry between regulator

Figure 1

Incentive power of pricing schemes



Source: adapted from Jones (1994).

and firm, the ability to design and implement the regulatory regime, the likely impact of the firm's cost-minimization activities, and the scope for efficiency improvements.

(i) Rate-of-return regulation*

Rate-of-return, sometimes known as cost-plus or cost of service, regulation is the traditional method of regulation of public utilities in many countries, including the United States (see Box 1). It ensures that the regulated firm earns a "fair" return on its invested capital, but not much in excess. It scores well on the criterion of restraining monopoly power, but poorly on the criterion of securing maximum operating efficiency, i.e. it puts emphasis on allocative rather than productive efficiency (Kay, 1993).

Under this system, the regulator establishes, through negotiations with the firm or on the basis of other factors, a rate of return which is above the market rate and guarantees this rate of return as long as investments are considered prudent. Tariffs are calculated so that total revenues equal total costs, including the cost of capital (fair rate of return). They are set for a fixed period of time, known as the period of regulatory lag, during which the firm can freely choose whatever input combination it wishes, although the regulator has oversight control over the firm's choices. Although tariffs are fixed until new ones are approved by the regulator, there may also be automatic adjustment provisions. The period of regulatory lag lasts until the next regulatory review which can be initiated by the regulator, the regulated firm, or the consumers. Reviews might occur at some time specified in advance or their timing might depend on the firm's behaviour or on other factors. The regulatory review is a process of checks and balances in which new prices are determined in negotiations between the firm and the regulator in representation of consumers.

Normally under this system if the regulated firm wishes to adjust its prices, it files to change the existing tariff, usually on the grounds that the achieved rate of return on the capital employed has become inadequate (Beesley and Littlechild, 1989). Rates are set on the basis of a number of factors (IEA, 1994). First, the magnitude of the assets that are "used and useful" in the provision of service is established. This is the "rate base" and it is usually calculated on the basis of historical costs, i.e. purchase costs less depreciation. Second, the regulator examines the utility's capital structure and sets the maximum return that it is allowed to earn on the equity part of the capital structure. Third, these data plus the cost of debt or

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* This discussion draws on Joskow, 1989, Laffont, 1994b, Train, 1991 and Vickers and Yarrow, 1988.

interest payments, operating expenses, including depreciation and an allowance for working capital, and assumptions about demand are used to calculate the "revenue requirement", i.e. the revenue that must be generated by sales to cover all legitimate expenses and provide a fair return to the shareholders. The regulator then proceeds to allocate the revenue requirement to the various categories of customers (e.g. residential, commercial and industrial in different seasons and different times of day) on the basis of the costs they impose on the system. Finally, rates are computed using established rate design methods.

Box 1

Electric utility regulation in the United States

In the United States, the electric power industry has, traditionally, been regulated under the rate-of-return system. Only recently, have regulators begun encouraging more competition and adopting incentives or performance-based and price-cap regulation.

Under this system, electricity prices are set to reflect the historical costs of providing supply to each class of consumer. Rate increases are based on a utility's revenue requirements and are set to provide a reasonable return on equity. More recently, the regulatory agencies have required utilities to consider marginal cost pricing, and in several states are now calculating prices based on long-run incremental costs and are implementing time-of-day and seasonal rates.

This cost-based regulation system has many strengths and the industry has sustained a good financial record - bankruptcy is extremely rare. Regulators have authority to require disclosure of financial information and to direct how accounts will be maintained. They can examine the reasonableness of investments and exclude them from the rate base when such investments are considered imprudent. The regulatory bodies have independent and professional staff who are free of political influence and are protected by law from dismissal for political reasons. Open hearings and transparent information on costs and performance help ensure the integrity of utilities. Customers, investors, suppliers, environmentalists, and the public are all able to participate in the regulatory process.

The system has, however, certain weaknesses. The costs of regulation tend to be high, especially for parties participating in studies and hearings, and delays can be frequent because of the quasi-juridical proceedings for rate changes. Rate-of-return regulation encourages utilities to seek rate increases to cover increases in costs rather than reduce costs or increase efficiency. Utilities that overinvest and maintain excess capacity usually are able to pass on these costs to consumers. Moreover, apart from regulatory directives, there are no cost or market-based incentives to adopt least-cost investment, load management, or energy conservation.

Source: World Bank (1992).

Under traditional rate-of-return regulation, utilities are allowed to earn an acceptable annual rate of return each year, so regulatory reviews can be frequent. Rate-of-return regulation provides, therefore, a better insurance to regulated utilities against cost movements than price cap-regulation will. In the United States, for example, suppliers can apply for a rate review at any time (Grout, 1995). Filing a rate case and obtaining governmental approval to change prices tends, however, to be time-consuming and expensive (Mathios and Rogers, 1989). In other countries, however, rate-of-return regulation does not provide for this flexibility.

In recent years traditional rate-of-return regulation has been criticized because it is difficult to define a "fair" rate of return, and because: (i) it provides poor incentives to minimize costs and innovate; (ii) it encourages the firm to use an inefficiently high capital/labour ratio for its level of output; and (iii) it requires too much detailed knowledge of the industry on the part of the regulator.

The fact that rate-of-return regulation is based on capping profits rather than prices means that poor incentives are provided for cost minimization, except in a limited way through the regulatory lag. Since prices are set so that the regulated firm is assured of a specific return on its investment after recovering its costs and its prices are reduced in step with decreases in costs, it may have relatively little incentive to engage in cost minimization behaviour and innovate its production technology and service offerings (Mathios and Rogers, 1989).

The *ex post* version of rate-of-return regulation in which the firm is reimbursed for its actual costs, including the opportunity cost of capital, provides no incentives whatsoever for cost reduction. The United States (or *ex ante*) version where the last period's costs serve as the basis for the current period's prices provides more incentives to reduce costs and the regulatory lag reinforces these incentives (Jones, 1994). A series of empirical studies of the United States drinking water supply industry, however, has failed to find significant differences in the relative efficiency of private utilities subject to rate-of-return regulation and public utilities which would seem to confirm the low incentive properties of rate-of-return regulation (see Feigenbaum and Teeples, 1983, Byrnes, Grosskopf and Hayes, 1986 and Lambert, Dichev and Raffiee, 1993).

The perceived insufficient incentives under rate-of-return regulation have led regulators to move away from its traditional forms and toward versions incorporating efficiency incentives (Braeutigam and Panzar, 1993). These allow firms to share in the social gains from efficiency through increased profits and thereby provide incentives for increasingly efficient production and innovation. One of the common approaches is the "sliding scale" version of rate-of-return regulation which is closer to price-cap regulation. Under this approach, regulated firms keep all profits if the

rate of return on investment is below a specified level and then they share in profits for at least some levels of the rate of return above that level. To implement this approach the adoption of a progressive profit sharing formula is recommended so that customers receive a larger portion of the initial gains and the portion the utility is allowed to retain from the additional cost reductions gradually increases (Navarro, 1996). This gives the utility a progressively rising incentive to reduce costs, otherwise it will pursue the easiest cost reductions and then stop cutting costs too soon.

Rate-of-return regulation can give firms incentives to employ too much capital, i.e. use an inefficiently high capital/labour ratio for its level of output, often called "gold-plating" or the Averch-Johnson effect (Averch and Johnson, 1962). This occurs because, although there are restrictions on the return that the regulated firm may make per dollar of capital, there are no direct limits on absolute profits, providing an incentive to expand capital stock to increase the total return (Boadway and Wildasin, 1984). Because of this problem, regulators are forced to scrutinize expenditures carefully. Regulators usually require their approval for new investments and often disallow excess capacity from the rate base. Conversely, to limit underestimates of demand, they can penalize a firm if rationing occurs (Lewis and Sappington, 1988).

To the extent that the Averch-Johnson effect operates, it does so subtly (Johnson, 1973). For example, it usually does not result in a firm purchasing additional equipment solely for the purpose of including it in its rate base holding it otherwise idle, rather it will seek to derive whatever additional revenue is obtainable through overcapitalization (Bailey, 1972). The validity of the Averch-Johnson thesis has been subject to some discussion. Some analysts assert that regulatory lag offsets the potential adverse effects of the Averch-Johnson effect, the incentives the effect provides may enhance productivity and it may have a beneficial effect as incentives to overinvestment may offset the monopolist's tendency to restrict output (Phillips, 1993). However that may be, in most cases investment is directly regulated (Laffont, 1994b).

Rate-of-return regulation has been criticized on the grounds that it takes into account the whole business, or a large part of it, rather than centring on the particular services where market failures are most pronounced and public concern is greatest (Littlechild, 1983). On the other hand, it is usually inconsistent with competition and liberalization, since competition from new entrants will reduce the rate of return below the specified level (Levy and Spiller, 1994). One way to reconcile rate-of-return regulation and competition is to guarantee a fair rate of return on capital to the totality of investors in an industry, but to make the prospective allocation of returns among the different companies dependent upon their relative performance (Vickers and Yarrow, 1988).

Rate-of-return regulation is very detailed in application, i.e. requires accurate and detailed information on costs and determination of how to allocate common costs among services that are provided jointly or in common, which makes it unduly burdensome and costly to operate. Measurement of the rate of return can also be the source of considerable controversy. Rate-of-return regulation involves extensive research into the accounts of regulated firms to determine which costs should be included in the rate base, and which should be disallowed, and how the costs should be allocated among services or groups of customers. In the cases where the regulated firm produces other unregulated and even regulated products and services, this can be a complex process which requires regulators to make inherently arbitrary allocations of costs and assets between individual services or groups of customers. In addition, regulators must monitor the utility's revenues, costs, and capital stock regularly to ensure that it remains within the imposed rate of return ceiling (Levy and Spiller, 1994). The complexity of the system is believed to encourage unproductive lobbying, misrepresentation and misreporting of information, and inflation of the base on which rates of return are calculated. However, effective regulation is necessarily a complex process and whatever form of regulation is implemented, regulators will require extensive information about the relevant demand and cost structures and detailed information about the activities and performance of the regulated firm (Vickers and Yarrow, 1988).

Notwithstanding the criticisms that have been made of its incentive properties, rate-of-return regulation does possess some basic advantages which make it possibly attractive for Latin America and Caribbean countries. By providing a solid guarantee of a fair rate of return, it offers a type of long-run commitment which is crucial for investments with a high sunk cost component, as in hydroelectricity generation and drinking water supply and sewerage (Laffont, 1994b). It also defines a feasible procedure which provides guarantees to investors against risk of bankruptcy and it provides for a strong system of checks and balances. In addition, rate-of-return regulation is likely to have a downward impact on the cost of capital (Grout, 1995). Although it may provide weaker incentives for cost reduction, it generally performs well in the presence of cost uncertainty and asymmetric information about the capabilities of regulated firms, particularly in terms of consumers' surplus, and reduces the ability of the regulated firm to profit from regulatory ignorance or favourable cost shocks (Schmalensee, 1989).

(ii) Price-cap regulation*

Price-cap regulation, as developed in the United Kingdom in the mid-eighties, attempts to avoid the problems associated with rate-of-return regulation, particularly its tendency to put upward pressure on costs, and seeks to both limit the scope for regulatory failure and to reduce the burden of regulation (see Box 2 and Figure 2). Three central ideas have been influential in its design: (i) regulation should be based on the regulation of prices rather than profits; (ii) the substitution of discrete periods between regulatory reviews for continuous intervention (Helm and Yarrow, 1988); and (iii) the idea of establishing regulatory "contracts" with regulated firms (Helm, 1993).

It is argued regulation of prices rather than profits provides strong incentives to improve efficiency and to innovate production technology and service offerings, helps promote competition, and also focuses regulation precisely on the particular services where market failure and public concern are greatest so ensuring that consumers are effectively protected against monopoly abuse. Price-cap regulation can be seen as a form of contracting where "the state, through the regulatory licence, contracts certain outputs and services to the private sector, in return for which the private sector is entitled to a revenue stream which is lined to inflation" (Helm, 1993).

Under price-cap regulation, the regulator sets a maximum tariff (the price cap) so that an efficient firm will on average obtain the cost of capital on the assets employed. In multi-output situations - e.g. where the firm operates in two or more regulated markets - the regulator either establishes a separate price cap for each service or applies an aggregate price cap for a basket of interrelated products often complemented by further constraints (e.g. maximum permitted annual price changes). Delegating some price authority to the regulated firm, allows it to adjust to shifting demand conditions and permits more efficient capacity utilization (Riordan, 1984). The regulator determines the way the price cap can move for a fixed period which is usually longer than the periods used under rate-of-return regulation. During this period, the price cap is adjusted by a preannounced factor that is exogenous to the regulated firm. Typically, this is the percentage increase in an index of relevant input prices or similar adjustment factors less an efficiency factor which represents an *ex ante* estimation of the increase in the regulated firm's productivity to share efficiency gains between customers and stockholders. Although price-cap regulation has been sometimes implemented without a limit on the rate of return earned, a more common approach also places implicit or explicit limits on the rate of return.

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* This discussion draws on Train, 1991, Cowan, 1993, Grout, 1995 and Beesley and Littlechild, 1989.

Box 2

Water industry regulation in England and Wales

The Water Act of 1989 established ten water service companies responsible for both drinking water supply and sewerage services and their shares were sold in a public floatation. The companies are free both to borrow on the private capital market and to raise fresh equity. They are required to cover all costs through user charges. Each of the companies has been granted a license - appointment - for a minimum period of 25 years. The license may be terminated by the government at any time on or after the expiry of that period, provided at least ten years' prior notice has been given.

The 1989 legislation also brought the older 29 statutory (privately owned) water companies (they are nor involved in sewerage) under the same regulatory regime as the rest of the industry. Prior to the 1989 reform, they had been subject to the regulatory controls, which were effectively a form of rate-of-return regulation in which any changes in costs were passed through to consumers. Since then their number has been reduced as a result of merges and joint management arrangements.

The 1989 legislation established a regulatory system and created the Office of Water Services (OFWAT). OFWAT is responsible for the economic regulation of the companies.

The primary duty of OFWAT is to secure that the functions of the companies are properly carried out and to secure that the companies are able, in particular, by securing reasonable returns on their capital, to finance the proper carrying out of their functions. Its other responsibilities include:

- protecting all actual and potential customers in respect of water charges, in particular rural customers, and ensuring that there is no undue preference or discrimination in the fixing of prices;
- protecting the interests of consumers in respect of other terms of service provision and in respect of service quality;
- promoting economy and efficiency on the part of the companies; and
- facilitating effective competition.

The costs of maintaining OFWAT are financed by a portion of the annual license fees levied on the companies. It has a staff of about 130 and operating costs for the financial year 1992/93 were £ 7.3 million (about US$ 11.2 million).

Either OFWAT or the companies can refer points of dispute to the Monopolies and Mergers Commission (MMC). Rulings of the MMC have the status of advice to the Secretary of State who is empowered to enact or reject it. The companies may appeal to the MMC if they wish to contest the actions of the Director General of Water Services (DGWS), head of OFWAT, in respect of determining price limits, amendments to their licenses, and accounting guidelines. Alternatively, either party can take legal action against the other party in relation to specific violations of the license. Thus far, little resort has been made to either the MMC or the courts to arbitrate over disputes.

The companies have their prices controlled through "price cap" regulation. They must restrict the rate of growth in their prices by the Retail Prices Index (RPI) adjusted by a factor, known as the K factor, which may be positive or negative. The adjustment varies among companies and through time, and is designed to allow companies to finance their investment programmes, while encouraging them to be efficient. The factor is fixed for 10 years, although either OFWAT or a company can apply for a review after 5 years. To cover the industry against unforeseen cost increases, reasonable extra costs can be passed through to consumers outside a formal periodic review. OFWAT can use the same procedure to reduce prices under some circumstances.

The objective is to set price-cap so that an efficient company has just sufficient income to finance itself. The procedure for setting price caps takes

(continued)

account of various factors, including company asset valuation, capital investment programmes, comparative efficiency of company operations, legislative requirements balanced, where possible, by customer requirements, and a fair return to shareholders. Efficiency targets are set in relation to both operation and capital expenditures and take into account comparative levels of service. The relatively long period of regulatory lag provides a strong incentive to the companies to improve efficiency.

The water companies are required to give OFWAT details of their investment plans and performance information covering standards of service, capital expenditure programmes and asset condition. There are also regular asset surveys and OFWAT monitors any variations from the original asset management plans. Company reports are independently verified.

OFWAT has found the principle of setting prices for long periods difficult to sustain. It has intervened frequently to alter prices. For example, in 1991, only two years after privatization, OFWAT wrote to several companies suggesting that they limit their price increases on account of the unexpected gains that appeared to have arisen since privatization. All companies chose to follow the regulator's suggestion and did not increase their prices as far as they could. In 1992, seventeen companies had their prices reduced through the cost pass-through mechanism as construction cost had fallen below the levels assumed in 1989.

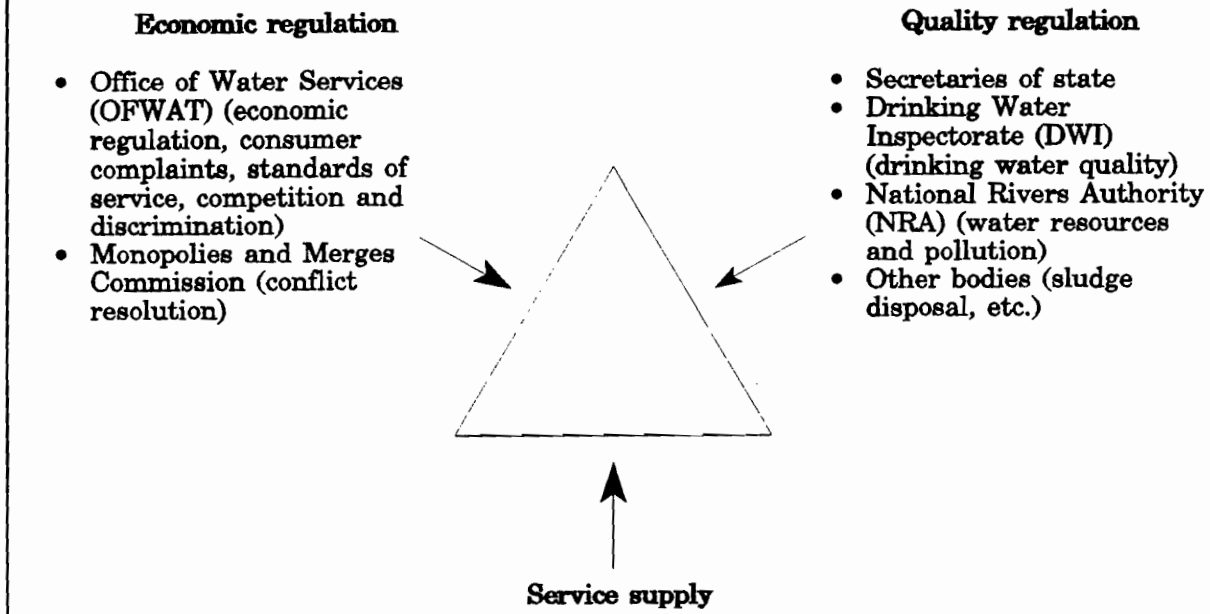
OFWAT decided to undertake the first regulatory review five years after privatization and in 1994 announced the new price regime for the 1995-2005 period based on smaller price increases, lower capital expenditure and higher efficiency savings. Price limits were set on the basis that profits would grow at a modest rate and that the return on capital would fall to about half the current level in real terms over the next ten years.

In fact, although nominally a price-cap, OFWAT action has much in common with rate-of-return regulation. The primary duty of the DGWS is to ensure that the companies are able to finance their functions and to earn reasonable returns on their capital, which implies that the rate of return is a major consideration in regulatory practice. This means that this form of price-cap regulation is a more incentive-compatible form of rate-of-return regulation rather than a radical departure from it.

Source: Armstrong, Cowan and Vickers (1994), Banyard (1995), Bishop, Kay and Mayer (1995), Booker (1994), Byatt (1995h), Cowan (1993), Grout (1995), Haarmeyer (1994), Helm (1994a), Kay (1993), McEldowney (1995), Mortished (1994), Myers (1995), OECD (1994) and Walton, Bateman and Heinrich (1994).

Figure 2

Water industry regulation in England and Wales



Source: Booker (1994).

At the regulatory review, the price cap, or its adjustment factor, is adjusted on the basis of the cost, demand, investment requirements, profit conditions, etc. of the regulated firm. The regulatory review provides the means by which consumers benefit from the cost-minimizing behaviour of the regulated firm because lower costs can mean lower tariffs. The review, needed to secure a reasonable rate of return, is also meant to deal with exogenous trends in firm profitability and initial design errors. There is usually a further procedure by which reasonable extra costs - to the extent that they are exogenous to the regulated firm and observable - can be passed through to consumers outside the formal periodic review.

Price-cap regulation is less vulnerable to the "cost-plus" inefficiency and the Averch-Johnson effect (Beesley and Littlechild, 1989). It also provides strong incentives to the regulated firm to produce with the cost-minimizing input mix, to

invest optimally in cost-effective innovation and to innovate in production technology and service offerings, and to adjust optimally to changes in cost. This happens because the regulated firm retains the benefits of any increase in profits derived from cost savings due to more efficient performance and cost-reducing innovations, at least until the next regulatory review. It also bears the costs of inefficient performance and a greater part of the financial risk.

The capacity of the price-cap regulation to encourage cost-minimizing behaviour depends on three factors:

- The "regulator's ability to derive some measure of what costs should be, which is at least partly independent of the actual costs incurred" (Kay, 1993). The incorrect selection of price caps may result in large inefficiencies even if inputs are chosen correctly for the level of output actually produced (Braeutigam and Panzar, 1993). The asymmetry of information between regulator and firm seriously constraints the regulator's ability to determine how prices would have changed under competition in response to variations in factor prices, general price level, changes in technology and consumer tastes and preferences, and income level and its distribution.
- Choosing the correct period between reviews: incentives for productive efficiency are good immediately following a review, but deteriorate greatly as the next review approaches (Vickers, 1991); eventually a firm would come to favour higher costs when review is close at hand (Vickers and Yarrow, 1988). A shorter period of regulatory lag will tend to reduce incentives for cost minimization and to increase uncertainty and regulatory risk, but a longer period may adversely affect allocative efficiency
- Restraint and commitment on the part of regulators: the efficiency incentives only apply if the utility believes that the benefits of efficiency savings will not be confiscated by *ad hoc* interventions (Helm, 1993). If regulators fail to provide long-term guarantees as to the decisions made at the regulatory review, the cost of capital will increase and there will be an incentive for underinvestment.

The incentive qualities of price-cap regulation also mean that profits and losses can diverge significantly from normal levels. This can be a serious problem because there are many indications that, for political and other reasons, regulated companies will never be allowed to earn excessive profits (Helm, 1994a) even though these profits will lead to future reductions in prices. The experience of British regulators would seem to suggest that public acceptability of price cap regulation will depend both on transparency and a willingness by companies to be ready to share at an early stage benefits with their customers (Byatt, 1995f).

On the other hand, if profits are below the cost of capital, a regulated firm is likely to demand a higher price cap on the grounds that low prices threaten its financial viability and given the high political visibility and economic importance of many water-based services and the problems associated with asset hand-over, such pressure may be successful. Given this, it could be difficult for a government to commit to pure price-cap regulation. However, if the regulators try to influence the regulated firm's rate of return when they are setting the price cap, "the scheme may degenerate to rate of return regulation" (World Bank, 1995).

These potential problems have led to the emergence of new regulatory instruments. In the United States, for example, one approach balances the risk of windfall profits or losses from the selection of inappropriate adjustment factor by the provision that if returns fall below a prespecified limit, price increases greater than those implied by the cap are permitted in some cases, but if the rate of return exceeds the higher limit, the firm has to refund the differences to customers (World Bank, 1994a). Under another approach, a regulatory institution offers the regulated utility a choice of a low price cap but no monitoring of profits or larger price cap but with closer monitoring of profits inducing it to reveal its cost-minimization ability and its attitude towards risk. Other proposals include the use of profit-sharing which involves giving customers a share of profits above a "normal" level through automatic rebates, and the imposition of a windfall tax on utility profits (Maddox, 1995).

Such schemes, however, can adversely affect incentives to reduce costs and are difficult to design. This would seem to suggest that regulatory discretion, provided that it is carefully exercised and that regulators explain the reasons for their decisions, is the most appropriate solution (Byatt, 1995d). In the United Kingdom, for example, industry-specific regulatory bodies enjoy a great deal of discretion in the performance of their duties and the Office of Water Services (OFWAT) has relied on this to limit the accumulation of abnormal profits by the water companies during periods of formal regulatory lag. This discretion has also led to significant inconsistencies across industries and a widespread feeling of lack of accountability (Ergas, 1994), and is considered to make United Kingdom-style regulation not readily transferable (Levy and Spiller, 1994).

Since price-cap regulation can effectively control the prices of dominant firms when the competitive marketplace controls their profits, it has been suggested that this form of regulation is probably most effective and appropriate as a transitory step on the path toward total deregulation and full competition (Braeutigam and Panzar, 1993 and Schmalensee, 1995). Although price-cap regulation performs particularly well under certainty, high levels of uncertainty generally make rate-of-return regulation and other regulatory regimes in which price depends in part on actual

cost preferable to pure price caps (the higher the degree of uncertainty, the higher cap must be set to keep the regulated firm profitable), particularly if regulators are more concerned with consumers' surplus than with the profits of regulated firms (Schmalensee, 1989).

One of the arguments for price-cap regulation is the lighter regulatory burden, and hence less scope for regulatory capture, and the reduction in the administrative and compliance costs of regulation, because it is unnecessary to measure the cost of capital or rates of return (Littlechild, 1983). The concern about allocative efficiency has inevitably forced regulators to consider such factors at review time (Armstrong, Cowan and Vickers, 1994). The fact that "rate of return considerations are necessarily implicit in setting and resetting" price caps (Littlechild, 1986) considerably increases the information requirements for effective regulation and blurs the distinction between price-cap approach and rate-of-return regulation. On the other hand, it is important to realize that it is the profit motive which gives the ultimate incentive for companies to improve efficiency and economies in the expectation of attracting investors and increasing business (Booker, 1994).

Initial expectations that price-cap approach would reduce information requirements, allow regulators to make do with relatively simple cost and demand information and avoid all the problems associated with profit control have "proved illusory" (Helm, 1994a). Public authorities quickly came to the conclusion that in a capital-intensive monopoly industry, such as the drinking water supply and sewerage, price controls must be complemented by an assessment of capital expenditure requirements, including recognition of the financing implications of the capital expenditure on price adjustments, and the provision for monitoring performance against defined levels of service (see Box 3) (Jeffery, 1994). As a result, British water regulators found themselves "dragged into a complex mass of detail - covering the intricacies of business plans and fixing the cost of capital and the value of shareholders' assets" (Helm, 1994a). However, this approach has avoided the lengthy price reviews and the huge legal bills that characterize rate-of-return regulation in the United States (The Economist, 1995).

There are strong reasons for preferring price-cap regulation initially following privatization. Principally because productivity gains are potentially larger at the time of privatization than subsequently, hence the improved incentive properties of price-cap regulation are particularly important during that period (Beesley and Littlechild, 1989). They are also potentially larger in industries where the underlying rate of change in technology and market conditions is faster (e.g. electricity generation). In the industries with a decentralized industrial structure, the reasons for preferring price-cap regulation initially are reinforced by the regulator's potential for generating superior information and overcoming the asymmetry of information through benchmark or yardstick competition.

Box 3

How is a price determined under a price-cap regulation system?

The process begins with using financial models to estimate the cost of capital to the industry, i.e. the minimum return that investors require to provide them an adequate incentive to invest in it. This estimate is applied to the value of capital assets employed in the company. The product of the cost of capital and the value of assets is an estimate of the minimum profits that the company requires to reward its shareholders adequately. The minimum profit is then adjusted by an estimate of operating costs to arrive at an estimate of the required revenue of the company. Finally, the revenue stream is converted to a price - the price cap - on the basis of a projection of demand.

Other factors that regulators may take into account at price review include future investment programmes, expected future changes in productivity, and the effect of price setting on actual and potential competitors. Making projections requires that regulators also make general assumptions about macro-economic factors such as future inflation, interest rates and real wage growth. Regulators may also need to ensure that the levels and trends of accounting ratios are appropriate. For example, prospective lenders take into account interest cover and the debt-equity ratio, so the regulator must ensure that the projected ratios are such that they do not jeopardize potential lending.

The calculation of the appropriate price-cap is fraught with many difficulties. For example, measuring the cost of capital is not easy. In the water industry in England and Wales, for example, there has been a great deal of disagreement about the appropriate measure of the cost of capital, even though there are standard approaches to its determination. There has also been considerable controversy over the value of the parameters that should be used, particularly the appropriate level of the risk premium for equity returns above riskless government securities. The utilities and the regulators have referred to estimates that differ by almost 6 per cent. Each extra 1 per cent return on equity is equivalent to £ 82 million (about US$ 130 million) of additional profits for the water companies.

Further complications can arise with the valuation of pre-privatization assets because assets that are in the public sector usually have no observable market value before privatization and because the accounting valuations shown in utilities' books typically bear little relation to the underlying economic valuation of the assets. The problem is particularly serious in the drinking water supply and sewerage sector because most of its assets are sunk in the sense that they are not transferable to other activities, and extremely long-lived. For example, in England and Wales, the book value of the water companies' assets on a current-cost basis exceeds their market value (as recorded by their stock-market valuations) by a factor of ten. As a result, it has been necessary to develop alternative methods of asset valuation based on the market valuations at the time of privatization. The problem was resolved by valuing the existing assets on the basis that the existing owners should neither lose nor gain from the changes in regime. This involved projecting the cash flows that the pre-privatization assets would have generated if the previous regulatory regime had continued.

These considerations help explain, at least in part, why: (i) price-cap regulation is considered to be more forward-looking than rate-of-return regulation, which is largely based on historical data, with adjustment for the future limited to an adjustment for inflation or the extrapolation of historical trends; (ii) price-cap regulation is considered to offer greater and more direct scope for bargaining, especially on productivity improvements, with a correspondingly more active role for the regulator, than rate-of-return regulation, aspect of particular importance in industries characterized by a high rate of change and many firms; and (iii) setting prices for several years is difficult where there are large investment programmes and where the degree of uncertainty surrounding capital expenditure programmes required to meet particular standards is substantial.

Source: Armstrong, Cowan and Vickers (1994); Bishop, Kay and Mayer (1995); Grout (1995) and Beesley and Littlechild (1989).

(iii) Regulation by commercial code

Commercial code regulation, also known as "potential" or "implicit regulation" or "regulation by threat" or "light-handed regulation" or "regulation without regulators", does not require a sector-specific regulatory framework. Firms operate freely without specific regulation, but regulators monitor and evaluate their performance on the basis of principles established by competition or anti-trust legislation in general. The monitoring does not need to be undertaken by a regulatory authority *per se*, this responsibility may be entrusted to an agency established by competition or anti-trust law, such as a fair trading commission or a monopolies and mergers commission (IEA, 1994). There is a credible threat of regulatory intervention if firms engage in anti-competitive behaviour, if prices rise too much or if quality becomes compromised or if customers are not reasonably satisfied.

The argument holds that the threat of regulatory intervention will create sufficiently strong incentives to comply with general efficiency principles and not to abuse the monopoly position that a company enjoys (Guasch and Spiller, 1994). Reputation effects may also be important: most well-know companies are concerned with protecting their reputation and that of their shareholders' in the market.

Studies of the behaviour of firms threatened with regulation suggest that (Glazer and McMillan, 1992):

- the behaviour of the monopoly threatened with regulation is determined by the marginal effect of changes in price on the probability of regulation;
- an unregulated monopoly will consider the effect of its pricing policy on the probability of regulation;
- because under a threat of regulation monopoly lowers price to prevent regulation, the actual imposition of regulation may have little effect on its price or on its expected profits; and
- firms may alter their prices more in response to changes in the perceived probability or strictness of regulation than to its actual imposition.

Commercial code regulation gives a firm strong incentives to reduce costs because of the - potentially - indefinitely long regulatory lag. Other advantages of commercial code regulation are that it is simple to implement, it is very inexpensive, and it provides a means to institute regulation gradually, all factors particularly important in countries with little experience in formal regulation. It is particularly suitable where the cost of errors is low and as a temporary measure to protect consumers against monopoly power until competition arrives. On the other hand, the rational fear, that some future government will impose strick price regulation, will force the

firm not to increase profits excessively which can be achieved by keeping prices low but also by not working too hard and not pursuing every opportunity to reduce costs (Jones, 1994).

Commercial code regulation does require a well-developed arbitration or juridical systems (Nellis and Roger, 1994), and is more appropriate for the countries with developed legal systems, regulatory precedents and political stability, and predictable regulatory policy. Under the right conditions, this approach may be a useful complement to or substitute for other forms of regulation, particularly in smaller countries and in the industries where effective competition is feasible. It can be strengthened by encouraging consumer participation in the oversight process and by organizing small customers into large, more effective bargaining units.

In the privatized drinking water supply and sanitation industry in England and Wales, for example, OFWAT has a role in monitoring levels of service relative to agreed standards of performance such as water pressure, flooding incidence from sewers, speed of response to billing enquiries and hose pipe restrictions (Armstrong, Cowan and Vickers, 1994). The Director General of Water Services (DGWS), head of OFWAT, has indicated that he will consider requesting the Secretary of State for the Environment to impose enforceable quality of service standards if the performance of water companies is poor relative to expectations.

Another example from the United Kingdom is electricity generation. The market structure of the British electricity generation industry has been described as an "unregulated asymmetric duopoly" - where two companies have substantial market power (Armstrong, Cowan and Vickers, 1994). Such a concentrated industry structure could well lead to serious inefficiencies. However, the threat of regulatory intervention to change licence conditions may be an important factor discouraging the two dominant incumbents from exercising their duopoly power (Rees and Vickers, 1995).

The threat of regulatory intervention might influence competition in hitherto unregulated industries (Armstrong, Cowan and Vickers, 1994). If a regulator, in judging the adequacy of competition, were thought to be largely influenced by price levels then a tacit collusion on maximum prices might result, with the aim of forestalling regulation rather than deterring new entry. Conversely, if the regulator were thought to be more influenced by market shares than by price levels, the incumbents might not mind a degree of entry and might even be inclined to dispose of some facilities to satisfy the regulator that no regulatory intervention is needed.

The competitive behaviour of state-owned enterprises is one of the sources of the threat of regulatory intervention. There is strong evidence that competition

between public and private utility companies - either in the form of direct market competition, or benchmark or yardstick competition, or by threat of displacement, as in the drinking water supply and sewerage sector in France - is highly conductive to improved performance (Kahn, 1988).

State-owned enterprises, if they behave as if they were operating in a competitive market, can provide a strong check on the ability of privately owned utilities to exercise market power (Schmalensee and Golub, 1984). If a state-owned firm lowers its price, this will stimulate the efficiency of the other firms in the market, irrespective of the reason why the prices have been lowered (Fraja, 1991). As a result, the presence of even a relatively inefficient state-owned utility may improve the overall efficiency of the sector. The competition between private and public enterprise can also be beneficial for the latter as competition can overcome, at least in part, a tendency toward the inefficiency resulting from public ownership (Caves and Christensen, 1980).

Competition may not be feasible unless state-owned utilities are placed on a non-subsidized, full-cost recovery basis (McCullough, 1992). Subsidized utilities could expand supply by virtue of their subsidy rather than because they use scare resources more efficiently (Joskow and Schmalensee, 1985). In addition, there is no guarantee that state-owned enterprises would behave competitively once free from direct governmental control and their anti-competitive behaviour can undermine investors' confidence and increase regulatory risk.

(b) The problem of asymmetric information

Adequate information is of paramount importance for effective regulation, but regulators are fundamentally constrained by the lack of information on the utilities they regulate (Laffont, 1994b). The regulated company's management always has (or can acquire) better information than the regulatory agency about both industry costs and demand conditions, including the effects of the incorporation of new technologies and the most efficient means of operation, and the firm's own behaviour, particularly its level of cost-reducing effort. This asymmetry arises because of such factors as proximity to clients and the production process, and differences in staff size, technical training, budgetary and other resources (Sappington, 1994b). The same problem also exists in the public sector (Laffont, 1994a).

Since the objective of a regulated industry is to maximize profits and, therefore, to be confronted with the weakest regulatory constraints, and since regulated firms have an element of control or even monopoly over the information provided to the regulator, there is an opportunity and incentive to present

information selectively and to distort it (Helm, 1994b). The problem is particularly acute in industries where the underlying rate of technological change is high, because the regulator's knowledge can become obsolete very quickly, and in industries where there is only one firm or a few firms which differ substantially one from the other (Beesley and Littlechild, 1989).

The information available to the firm's management is not in itself perfect, but it is better than that available to the regulator. Even where relevant demand and cost structures are observable in principle, the detailed and sophisticated knowledge that the firm has, cannot be matched by most regulatory bodies given the resources and manpower available to them (Lewis and Sappington, 1988). As a result, companies are almost always better informed than regulators about the consequences of adopting particular regulatory schemes for prices or conditions of service (Acton and Vogelsang, 1989). Additionally, as many water-related assets are underground and also have very long working lives, the monitoring of capital and maintenance spending is much more difficult in the water sector than elsewhere (Kinnersley, 1990).

In most regulatory settings, the regulator can to an extent observe the level of costs incurred by companies, particularly product-specific costs of one- and multi-product firms, as well as the level of their earnings, but cannot observe any cost-reducing effort, which is the key to productive efficiency and a prerequisite for effective regulation. The latter problem is especially important because a firm can influence its environment, i.e. cost and demand conditions, by expending effort which the regulator cannot see.

Asymmetric information and limited observability mean imperfect incentives and impaired economic efficiency, creates a divergence of interest between the regulated firm and its customers, and gives rise to strategic behaviour on the part of both the regulator and the regulated firm. If the regulator is uninformed about industry condition, then any regulation, even optimal, will leave firms with undesirable rents due to their monopoly of information (Armstrong, Cowan and Vickers, 1994). Asymmetric information allows a firm to extract rents from its monopoly of information and hence obtain supernormal profits resulting in an overall welfare loss or allocative inefficiency. Thus, asymmetric information blocks the possibility for simultaneous attainment of productive efficiency, which requires that price be kept as low as possible, and allocative efficiency, which requires that price be kept close to marginal cost, and leads to a trade-off between them (Rees and Vickers, 1995).

The existence of informational asymmetry suggests that instead of using command-and-control methods, i.e. instructing the firm on every aspect of its

operation and requiring it to follow the orders it is given, and relying on micro-management, the regulatory goal should be to design incentive mechanisms for the regulated firm that will motivate it to employ its superior information to maximize society's objectives while pursuing its own self-interest, rather than to extract rents from its monopoly of information (Acton and Vogelsang, 1989 and Sappington, 1994b). This means, for example, that when the firm has better knowledge that the regulator about production technology, and hence about the likely consequences of different cost reducing activities, it may be better, for the firm and for the customers, if the firm is rewarded for achieving cost reductions, but is not told exactly how to achieve the desired results (Sappington, 1994b).

When the regulator cannot observe directly all relevant actions undertaken by the firm, the appropriate course of regulatory action would be to provide indirect incentives for the firm to act diligently (Sappington, 1994b). The regulator can achieve this by basing the firm's compensation on observable performance measures that are correlated with its unobservable behaviour. The use of observable performance measures to motivate the regulated firm to undertake unobservable actions depends on the characteristics of performance measures, particularly sensitivity and variability. The former refers to the extent to which the observable measure is correlated with the underlying unobservable activity, while the latter characterizes the "noise" in the relationship.

The regulator should seek to base the firm's compensation on those observable performance measures which are closely and systematically correlated with the key unobservable activities (Sappington, 1994b). Since the unduly "noisy" relationship will tend to increase the cost of capital, the regulatory policy should seek to reduce undesired variability in performance measures. This can be accomplished by controlling for the factors exogenous to the firm (e.g. weather conditions), basing the firm's compensation on the sufficiently long history of its performance rather than on isolated events, or using ranges and general performance targets, possibly in conjunction with measures of benchmark or yardstick competition, rather than specific performance measures. Except where regulatory goals are very specific or broad-based performance measures are insufficiently sensitive or excessively variable, it might be advisable to avoid targeting specific components of cost and service quality in incentive scheme because this risks - because the firm has better information about how to best achieve a broad goal relative to the regulator's information - distracting the firm from pursuing those cost-reducing activities for which it does not receive explicitly targeted rewards.

The prospects of generating information for regulatory purposes should be an important consideration in a government's decision about the nature of the regulatory regime and the structure of the industry (Beesley and Littlechild, 1989).

Efficient regulatory systems should incorporate mechanisms designed to overcome informational asymmetries. This requires substantial regulatory discretion - appropriately restrained - as well as substantial administrative capabilities and sophistication (Guasch and Spiller, 1994).

These considerations suggest that price regulation is likely to be most effective in the industries where the extent of the information asymmetry between regulator and firm is small or where the regulator can reduce the firm's informational advantage and acquire adequate information without undue difficulties. Industries that satisfy these conditions are usually those: (i) where underlying technological and market conditions change slowly, like drinking water supply and sanitation, and the regulator can gradually acquire more relevant information that will permit it to set realistic efficiency targets; and (ii) where there are many firms in an industry and the regulator can use the performance of one as an indication of what another could achieve (benchmark or yardstick competition) (Beesley and Littlechild, 1989).

(i) Information-extracting mechanisms

There are several information-extracting mechanisms by which a regulator can reduce the informational advantage which the regulated industry enjoys.

Direct market competition. Competitive market prices aggregate and communicate dispersed information and thereby influence the direction of entrepreneurial energies (Vickers, 1995). In the sectors which can be restructured to ensure effective and undistorted competition (e.g. electricity generation) direct market competition is the most efficient way to solve the problem of asymmetrical information. Unfortunately, technological characteristics and demand and cost structures of many water resource management activities are such that except at the unacceptably high cost of a spatially fragmented industrial structure and a major loss of substantive economies of scale and scope, there are limits to substantially increasing direct market competition.

Franchising (competition for the market). Where direct market competition is not possible within an industry, franchising, or competition for the right to be the monopolist, is another information-extracting mechanism. Where many parties facing the same technology and production costs enter non-collusive bids for the right to be the monopolist the competition for the market among the *ex ante* producers will hold in check the potential informational advantage of the *ex post* supplier through the competitively determined terms of the franchise contract. This competition will increase efficiency and bid down the price of the product to the point where it does not reflect the monopoly power of the eventual holder of the franchise. Franchise

bidding acts as a discovery mechanism which enables the regulator - through competition rather than through administrative decision - to select the most efficient firm and to reduce the size of the informational rents it enjoys (a detailed review of franchising, its applicability and limitations as regards the provision of water-related goods and services is to be found in UN/ECLAC, 1995b).

This approach is increasingly used in Latin America and the Caribbean. One example is the Buenos Aires concession where the contract was awarded to Aguas Argentinas, a consortium led by Lyonnaise des Eaux Dumez, which won the concession with a bid which reduced residential user tariffs by about 27 per cent (Richard and Triche, 1994). Any subsequent tariff adjustments will be based on the changes in the cost of service provision.

Contestability (threat of entry). The theory of contestable markets (see Box 4) suggests that the threat of hit-and-run entry and the associated competition can serve to limit the monopolist's capacity to extract informational rent (Baumol, Panzar and Willig, 1982). In the water sector, public authorities can use contractual arrangements to create an environment of contestability. Contestability can be facilitated by encouraging new private operators to enter the market by removing and reducing barriers to entry and exit and ensuring that new rivals can compete on fair terms with incumbents. Provisions can be included in regulatory schemes to ensure that an alternative producer can be called upon to replace the incumbent if the latter fails to meet certain specified performance targets. For this and other reasons, such as the likelihood of service disruption, some countries retain a capacity to compete with the private contractors, or to provide a residual means of performing essential functions should the contractor fail (Kessides, 1993).

Benchmark or yardstick competition. The most promising attempt to formally address the problem of asymmetric information in the privatized water-related utilities seems to be through benchmark or yardstick competition, also known as competition by comparison or competition by example. This method promotes competition in cost minimization between monopolists indirectly - via the regulatory mechanism - by replicating comparisons with performance elsewhere.

Endogenous information. Regulators can improve access to the internal information of the regulated firm. For example, they can undertake audits, although audits can be expensive and errors are possible. Since the opportunity to audit would yield welfare improvements, regulatory bodies usually audit and monitor costs and have the authority to impose penalties by disallowing costs and by ordering refunds to customers when, on the basis of an audit, they find that a firm had overstated or overestimated its costs (Baron and Besanko, 1984).

Box 4

The theory of contestable markets

A perfectly contestable market is one in which entry and exit are absolutely costless. In such a market, competitive pressures supplied by the perpetual threat of entry, as well as by the presence of actual current rivals, can prevent monopoly behaviour.

If sunk costs were zero, even where economies of scale are significant, a potential entrant could undercut any excessive prices (or unnecessary costs) of incumbent firms yet earn an attractive rate of return. This is a very improbable situation in most water-related industries. In the absence of other restrictions on entry and exit, economies of scale alone do not constitute an effective barrier to entry. Perfect contestability precludes excessive profits and prices as well as waste and inefficiency, and prevents anti-competitive behaviour.

Baumol, Panzar and Willig (1982) showed that "if an industry is structurally contestable and is behaving accordingly, and if, in addition, it has sustainable configurations available to it, and if none of these involve any significant welfare problems, then that industry is best left to its own devices with no government interference, *even if it is composed of a very small number of firms*". Where an industry is not behaving in that way, even though there are no inherent structural impediments to contestability, then the most promising course for public policy is identification and removal of any artificial obstacles to contestability and the prevention, so far as possible, of anti-competitive behaviour by incumbents. This is normally called a process of deregulation. If the industry is structurally not contestable, it may still be possible to seek measures that decrease "natural" entry barriers. Another option would be to isolate the portion of the industry's activities that causes uncontestability and regulate that portion, leaving the remainder of the industry's activities free from government interference.

Competitive discipline can prevail if sunk costs were zero, but sunk costs weaken the disciplining power of market contestability and thus yield a wide diversity of dynamic patterns of market performance. Yet the disciplining power of contestability remains impressive in preventing sustained monopoly pricing.

Although at a first glance, most water-related industries do not seem to come close to satisfying the conditions of contestability, since entry involves substantial sunk costs and dominant incumbents have at their disposal a range of instruments of strategic entry deterrence and of exit inducement, nevertheless some forms of private sector participation may create an environment of contestability.

For example, although sunk costs are a fundamental characteristic of networks, they are not necessarily so important for the provision of services over networks. For the tradable goods and services produced in the water sector (e.g. irrigation and hydroelectricity generation), freedom of trade and reduced transportation costs can supply the beneficent pressures of contestability.

A market can remain highly contestable if it is feasible for an entrant to achieve contractual relations with prospective customers, which can render the entrant immune from retaliation. Where this is true, the incumbent can protect itself from intruders only by behaving well - for instance, by offering customers reasonable prices and a good level of service. Such behaviour will foreclose entry opportunities, but only by providing customers with all the benefits that an entrant could be expected to bring.

The degree to which costs are sunk may depend in part on public policy. In the water sector, public authorities can use franchising and other measures to create an environment of contestability. Although there may still remain barriers to entry and competition imposed by protectionist policies, lack of adequate regulation (e.g. regarding access on a fair basis to network facilities) or other factors (e.g. access of potential entrants to capital markers and to foreign exchange), these barriers may be addressed separately as long as an activity is contestable in principle. Governments can facilitate contestability by encouraging new operators to be formed and ensuring that they can compete on fair terms with incumbent suppliers. Contestability can also be encouraged through the promotion of leasing and the development of a domestic market for reselling capital equipment.

(continued)

The French experience in the provision of drinking water supply and sanitation services demonstrates that the contestability of the franchise can achieve almost the same efficiency benefits as competition. In France, municipalities own the physical assets of the sector and secure management through a wide range of franchise contracts (e.g. leasing and concessions) with private companies as well as retain the right to operate the system themselves. Since the threat of being replaced provides a powerful incentive for good performance, incumbent franchisees normally win contract renewals over challengers. The end result is that the drinking water supply and sewerage market of each municipality is contestable and consumers appear to be satisfied with the level of service they receive. This approach creates a workable market for water services, a market that appears to work so well that price regulation, which is a major issue in the private water industry in England and Wales, and in the United States, is virtually non-existent in France.

The French experience could have important implications for Latin American and Caribbean countries in that it underlines the desirability of the flexibility to switch from one form of contractual relation to another, from public to private and vice-versa, and existence of several companies that can operate in the sector. For this reason, as markets expand, governments that choose private participation would be well advised to encourage the emergence of competing companies, rather than leave sector operation in the hands of a single private or state-owned company.

In the privatized drinking water supply and sewerage industry in England and Wales, OFWAT can create partial contestability by making new appointments for new developments within existing allocated company areas. These are known as "inset appointments", the appointment of new licensees to supply new developments and customers that consume more than 250 megalitres of water a year within an existing undertaker's area. The competitor would have to be able to supply water to the site either by laying new pipes from an existing supply or via a bulk supply or sewerage connection from a local company. The terms and conditions of such connections are determined by agreement between the interested parties or by the DGWS if they fail to reach an agreement. In addition, OFWAT is considering introducing a common-carriage approach to competition for water services (use of a competitor's network to carry the product to the customer), an approach which is already widely used in the electricity sector. Common-carriage is already widely practiced in the water industry is the form of bulk supply.

The existence of regulatory barriers - permissions, licenses, concessions, etc. - weakens the impact of contestability because some potential entrants who may wish to enter the market to compete cannot do so because they fail to hold the relevant permission or license. The existence of the regulatory instrument itself and the longevity of such instrument represent a barrier to free entry and limit the validity of the contestable markets theory in the sector. The barrier to entry is especially large when regulatory instruments are for long periods and require a long termination notice.

The system of re-bidding for concessions at shorter periods lowers the barrier represented by the existence of the instrument itself by affording an opportunity to new entrants to outbid for the existing concession. However, this approach has its drawbacks. The practical application of contestability is also hampered by "invisible" barriers to entry, such as the information asymmetry between incumbent and challengers and the winner's curse.

The theory of contestable markets is not universally accepted. On the whole, the main contribution of the theory may be as a guide for regulation. On the other hand, it has also been characterized as a theory of the consequences of deregulation rather than as a theory of regulation.

Source: the discussion of the contestable markets theory is based on Baumol and Lee (1991), Baumol, Panzar and Willig (1982) and Coursey *et al.* (1984); its criticism is to be found in Shepherd (1984); the discussion of its application in the drinking water supply and sewerage sector and examples are from Booker (1994) and Haarmeyer (1994); other sources are Kessides (1993), Lyon (1995), Mulgan (1994), Peterson (1991b), Stewart-Smith (1995), Triche (1993), Vickers (1991) and Winston (1993).

Regulatory authorities should also ensure the transparency of information. Transparency of accounts in a very important feature of regulation in the United States where a "Uniform System of Accounts" is used that classifies all utility accounts under a common system (IEA, 1994). It should be borne in mind, however, that, although internal information is important, regulatory authorities should avoid placing unnecessary burden on utilities. It is the quality of information what matters, not quantity. Collecting more data than needed does not contribute to efficient decision-making.

Exogenous information. Finally, regulators can seek exogenous information in order to reduce the informational advantage that the regulated utilities enjoy. Sources vary, but usually include these broad categories of data: general cost trends in the economy, expert engineering appraisals, equity and debt market valuation of risk (cost of capital), and utilization tests and system comparisons (asset valuation) (Helm, 1994b). Last but not the least, the customers can be useful sources of information.

Most of the information which regulatory authorities have on company performance should be made available to the public so that customers can judge for themselves that their interests are being protected (Byatt, 1995a). Access to information on company performance increases accountability of service providers and regulators, improves and stimulates public debate on water-related issues, and reduces the risk of regulatory capture. It also makes the regulatory process more efficient because it encourages independent research of regulatory issues.

(ii) Benchmark or yardstick competition

The most promising attempt to overcome the problem of the asymmetry of information is benchmark or yardstick competition (Kay, 1993). The basic principle behind this is to decouple the utility's price structure from its own reported costs and hence limit its opportunity to distort its cost data, i.e. to regulate each firm by making its reward contingent upon the performance of others or that of an efficient prototype as well as its own performance (Weyman-Jones, 1995).

Benchmark competition promotes competition between monopolists indirectly - via the regulatory mechanism - by replicating comparisons with performance elsewhere, nationally or internationally. It reduces the rents which individual regulatees can extract from the monopoly of information they enjoy and hence improves the terms of trade-off between productive and allocative efficiency (Armstrong, Cowan and Vickers, 1994). It has two important advantages: (i) because each firm can keep the benefits of its cost-reducing activities, it gives a strong

incentive to be more efficient than the average, thus improving internal efficiency; and (ii) by keeping prices and service standards in line with the industry averages, it passes on to the customer the benefit of the average cost reduction and service quality improvement, and hence improves allocative efficiency.

The opportunities for the use of benchmark competition in the water industry follow from the fact that - as a result of the common regulatory structure and many common features in the operational environment and in the input and output markets of the service providers - when setting prices or target service quality levels for one firm, the performance statistics of other firms usually contain informative signals concerning the underlying economic trade-offs faced by the given firm's management (Vickers and Yarrow, 1988). The more closely the cost conditions of one firm are correlated with another's, the more effectively benchmark competition can be implemented. On the other hand, if the firm's compensation is based on benchmark competition, the firm should not be able to influence the benchmark to its strategic advantage; ideally, the benchmark should be entirely exogenous to the firm.

It is not easy, however, to implement benchmark competition and regulators have found it difficult to incorporate it explicitly in regulatory frameworks (Cowan, 1993 and Helm, 1994a). In the United Kingdom, for example, although the regional structure of the electricity supply and water industries could allow benchmark competition between regional companies, "little *explicit* use has been made of" it (Armstrong, Cowan and Vickers, 1994). Nevertheless, OFWAT has relied heavily on it to set tight price limits and secure good standards of service for customers (Byatt, 1995i). Benchmark competition is expected to play an increasingly useful role in the regulation of the industry once the huge investment programme, which at present is the main factor in tariff-setting, has sufficiently stabilized (Armstrong, Cowan and Vickers, 1994).

The main difficulty is that where the cost conditions of different firms are not sufficiently correlated, the introduction of benchmark competition could increase the uncertainty and risk facing the regulated firms. Given that there are important differences in the economics of water management activities between geographical regions and the asymmetry of information, it can be extremely difficult to factor out exogenous location-specific influences from local costs even with sophisticated econometric techniques. The costs incurred by any one firm depend on a large number of factors, some of which can only be measured imprecisely (Bishop, Kay and Mayer, 1995). There are also problems in incorporating the relevant factors in an econometric regression, as it is not always clear what factors are exogenous and what are not or what output measure should be used. Econometric modelling is always subject to some degree of estimation error. In addition, the burden on the

industry of information provision and on the regulator of information processing is heavy (Armstrong, Cowan and Vickers, 1994).

Another potential difficulty with implementing benchmark competition is that it can: (i) give incentives for one firm to intentionally undermine the performance of other firms included in the benchmark; (ii) undermine incentives for the regulated firms to share research findings or otherwise collaborate with each other; and (iii) encourage all firms to collude to implement uniformly low levels of measured performance (Sappington, 1994b). To overcome these difficulties, it would be advisable to reward each firm on its performance relative to other firms and on some absolute measure of its individual performance.

While it is clear that benchmark competition is potentially a very useful source of information, the development of a practical means of incorporating it explicitly into a regulatory framework remains a major challenge. As a result, benchmark regulation is rarely used explicitly in price controls, rather it is seen as an extremely desirable complement to other regulatory mechanisms which can help address the problem of asymmetrical information and mitigate some of their undesirable effects.

The advantages of benchmark competition are part of the case for having horizontally separated companies (e.g. regional) rather than a single national company in natural monopoly industries (Vickers, 1995). Despite its problems, benchmark competition is increasingly used, usually implicitly or informally, in the regulation of the energy and water industry in many countries. For example, the service area for the franchise contracts to renovate and improve the drinking water supply and sewerage services in Mexico City, Mexico, was awarded for four similar-sized zones so as to permit performance comparisons (Casasús, 1994).

In Chile, economic regulators use a model company variant of benchmark competition. The reference model establishes a standard for efficiency for utility companies. A company benefits if its costs are below those of the reference provider. This encourages utilities to match or exceed the reference level of operating efficiency of the model company in order to maximize their profits. The system has been successful, but there is obvious room for improvement and the regulators are considering modifications to the present system with the introduction of further private sector participation.

In France, the contracts of the local water companies usually depend on the quality of services and their production costs relative to those of other water companies (World Bank, 1994a). The existence of two dominant firms in the provision of services, Compagnie Générale des Eaux and Lyonnaise des Eaux, permits the use of benchmark indicators (Kessides, 1993). The Paris "affermage"

contract gives one company responsibility for the Left Bank of the Seine River and another responsibility for the Right Bank (Haarmeyer, 1994) provides a measure of comparative or benchmark competition (Kessides, 1993).

(iii) Benchmark competition and mergers

Benchmark competition is possible where there are different providers of comparable services, e.g. regional drinking water supply and sanitation companies, provided that they operate in similar environments (regulation, demand and cost conditions) and do not collude.

Mergers, takeovers, joint management arrangements and other changes in the industry structure can affect the regulator's ability to effectively use benchmark competition (market concentration reduces the effectiveness of econometric analysis and the efficiency of frontier modelling, and might facilitate collusion, as collusion might be easier among fewer firms). This does not rule out mergers, but since the loss or degradation of comparators, particularly among bigger or more efficient companies, damages the efficiency of benchmark competition, a regulator should seek: (i) to create new and improved comparators; and (ii) to link this with immediate benefits to customers, notably in the form of lower prices (Byatt, 1995b, 1995c, 1995g and 1995i). This can normally be achieved through substantial price reductions which force the newly-merged company to become more efficient and ensure that customers, as well as shareholders, benefit from the merger. The magnitude of price reductions or other remedies sought in each case should reflect the effect of the proposed merger on the regulatory regime. Other measures could be necessary to enable the regulator to have proper access to information about the performance and costs of the newly-merged company, and about the efficiencies and cost savings arising from the merger (OFWAT, 1995p).

In the privatized water industry in England and Wales, for example, the ability of the DGWS to make comparisons between companies is protected by the provision in the Water Industry Act of 1991 for automatic reference to the Monopolies and Mergers Commission (MMC) of mergers between water companies if the value of the assets of the acquiring company and the company being taken over each exceed £ 30 million (about US$ 46.2 million) (HMSO, 1993 and OFWAT, 1995m). When determining whether a merger will operate against the public interest or not, the MMC is obliged to have regard to the desirability of giving effect to the principle that the number of water companies which are under independent control should not be reduced so as to prejudice the ability of the regulator to make comparisons between them (Armstrong, Cowan and Vickers, 1994). The MMC agrees to the reduction of the number of comparators if there are substantial benefits from

economies of scale and scope and if the claimed gains from the merger are passed back to consumers, e.g. in the form of lower tariffs.

One example is the Three Valley merger which involved three water-only companies which shared an important water treatment works and had cooperated for a long time (Armstrong, Cowan and Vickers, 1994). Although the MMC found that the merger was against the public interest because it would reduce the number of independent comparators, it was allowed to proceed on the condition that efficiency savings of 10 per cent would be passed through to consumers.

More recently, the takeover of the Northumbrian Water by Lyonnaise des Eaux of France, which will merge Northumbrian's operations with the neighbouring North East Water, was allowed to proceed on the condition that it guaranteed price cuts of 15 per cent in customer's water bills by 2001 (Price, 1995). In addition, Lyonnaise des Eaux has given undertakings that it will not mount any takeovers or acquire sufficient interest to enable it to influence the policy of any other water or sewerage company in England and Wales for ten years unless it has the DGWS's consent (OFWAT, 1995o).

2. Other forms of conduct regulation

A number of other issues of significance in the practice and discussion of conduct regulation have application to the regulation of the private provision of water-related services. In the regulation of natural monopolies of the public utility type there is an need to control incentives to under-provide quality, to consider the possible underinvestment problem which arises if the regulator cannot fully commit itself not to behave opportunistically, and the implications of the underinvestment problem for the structure of water-related investments.

(a) Quality of service[*]

Any public utility has the obligation to render safe and adequate service (see Box 5). A reduction in the quality of output or service standards is equivalent to an increase in price. Without adequate quality of service regulation, price regulation may be rendered ineffective: "buyers can be exploited just as effectively by giving them poor or unsafe service as by charging them excessive prices" (Kahn, 1988).

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[*] This discussion draws on Cowan, 1993, Leland, 1979, Rovizzi and Thompson, 1995, Shapiro, 1983, Spence, 1975, Vickers, 1991 and Vickers and Yarrow, 1988.

Box 5

Legal aspects of quality regulation

Effective control of drinking water quality depends on the existence of adequate legislation which should clearly state that the service provider, who sells water to the customer, carries the legal responsibility to supply safe and wholesome water to the house connection. The service provider must be responsible both for product liability and for the provision of continuous and effective water quality control. The water utility should also have the legal responsibility to notify the public of any serious deterioration in water quality.

A utility should not be held legally responsible for deterioration of water quality within the household. In addition, it is advisable to consider making legal provisions enabling a utility to initiate legal actions to protect its water sources and distribution networks from pollution and other interferences, particularly where there are no effective pollution control programmes.

The health and water management authorities should place the burden of the primary level of water quality control testing on the utility, which should develop the infrastructure necessary for quality control and recover the costs through the proper pricing of the water supplied to the customer. At the same time, a system of independent surveillance should check water quality. The public should have free and regular access to this information.

Source: Shuval (1992).

In the countries where the state-owned enterprises have been entrusted with regulatory functions with respect to quality-related issues, privatization necessarily involves the reallocation of these responsibilities to an independent regulator. Keeping agencies responsible for operating functions independent of those with regulatory responsibilities is necessary to ensure consistent and unbiased administration of regulatory standards and because a service provider with quality regulation functions can control access to the market and deter potential competitors.

(i) Service quality under monopoly provision

In a market in which there is full and effective competition, and hence no asymmetry in information, there should be no reason to regulate service quality. If a firm arbitrarily reduces the price/quality combination it offers to consumers, this will lead to a corresponding reduction in its market share. Customers will switch to other products or firms, and competition will ultimately weed out those firms which fail to produce the price/quality combination which consumers demand. The only effect of service standards under the regime of perfect information and perfect competition would be to restrict artificially the range of products offered for sale (Shapiro, 1983).

The market system is based on a model in which all buyers and all sellers would have "perfect information" on the products and prices being asked and offered in all parts of the market. In reality, in most markets, including those for water-related goods and services, there is an informational asymmetry in which the firm knows the quality of the product it sells, but its customers do not have complete information about all aspects of quality. In the drinking water supply and sanitation sector, for example, some aspects of the level of service that a firm provides, such as water pressure, incidence of flooding from sewers, speed of response to leaks or other complaints, among others, and of water quality, such as colour, odour, sediment and taste, are readily discernible by consumers. Many other aspects of quality are much less observable, however, unless consumers test the water themselves.

This informational asymmetry constraints the ability of consumers to choose among suppliers. In the regulation of quality, the "issue is not high or low quality *per se*, but that efficient price/quality combinations are offered to consumers. If (say) the buyer of a product is less informed than the seller about its quality, then there may be a bias towards inefficiently low quality, mutually advantageous trades involving high quality may fail to be accomplished, and market breakdown can even occur" (Vickers, 1991).

In markets, even competitive market, with informational asymmetries, and no regulation, there is an incentive for sellers to reduce quality and take short-run gains (Shapiro, 1983). Such markers reach equilibrium at sub-optimal quality levels and are characterized by general quality deterioration (Leland, 1979). Minimum quality standards in such markets are normally considered to be socially desirable. They could also be desirable where consumers cannot readily evaluate the information available and the costs of mistakes are high. The good reputation of the supplier - one worth protecting - could be expected to ameliorate, at least some of the adverse effects of asymmetric information.

Even where consumers have complete information about product quality, a monopoly, however, has incentives to reduce quality, particularly if by so doing, it can reduce its costs. The revenue penalties to the monopoly from reductions in demand are small where substitutability in demand is limited, i.e. where quality reductions have relatively small effects on the quantity demanded at the relevant price (Vickers and Yarrow, 1988).

In general circumstances, the unregulated monopolist's selection of product characteristics is likely to be biased away from the social optimum; in the case where price is fixed, the firm always sets quality too low (Spence, 1975). Since no firm can, absent perfect price discrimination, capture all of the marginal social benefits of

extra quality, it has an incentive to under-provides quality for a given price. The magnitude of the bias to reduce costs by reducing quality would be greater: (i) where the price elasticity of demand is low; (ii) where the valuation placed on quality change by marginal consumers is low relative to the average; and (iii) where price discrimination is not feasible (Rovizzi and Thompson, 1995).

These considerations imply that under monopoly, the quality problem is potentially a serious one. Unfortunately, the regulation of service and product quality is one of the most neglected problems in the debate on private sector participation in the water sector. Given that competition is at present limited in the core transportation and distribution services of the water sector, that markets for its services are characterized by informational asymmetries, and that most service providers operate under regimes of monopoly, it is extremely unlikely that price control alone would be capable of giving sufficient incentives to profit-maximizing firms to make socially optimum quality choices.

There are qualifications to this conclusion. Even under monopoly provision a change to more market-style management should lead to a general enhancement of service and product quality. In the industries where full and effective competition is feasible, liberalization and other structural reforms which promote competition are likely to lead to enhanced product quality and product differentiation by comparison with that offered under public sector provision. Reputation effects may also be important as well-know companies move into the sector.

On the whole, there is, therefore, a strong case for supplementing price regulation with the regulation of service quality. An important role for the government is to set standards, to ensure their enforcement and to establish an appropriate system of incentives. The regulation of product quality tends to be more advantageous in markets characterized by: (i) greater sensitivity to quality variations; (ii) low elasticity of demand; (iii) low marginal cost of providing quality; and (iv) low value placed on low-quality service (Leland, 1979).

Logically, a profit-seeking drinking water supply company would not be confronted with non-regulatory incentives to increase the quality of the service it provides unless the service is metered (Cowan, 1993). The reason for this is that an increase in quality might encourage additional consumption, and hence impose additional costs on the firm, but there is no direct means for it to obtain extra revenue as a result of the incremental demand. A lack of metering may even encourage a firm to reduce the quality of the service it provides. Reputation effects may negate this argument.

(ii) Alternative mechanisms for service quality regulation

In considering incentives and regulatory instruments for service quality control, it is useful to distinguish between those aspects mainly determined by managerial efficiency (e.g. the speed of response to leaks or other complaints, timely connections and repairs) and those that primarily depend on capital expenditure (e.g. drinking water and effluent quality, adequate capacity, modern technology, reliable electricity and drinking water supplies) (Vickers, 1991).

There are four broad modes of service quality regulation, three are particularly appropriate for managerial efficiency, publishing information on quality performance, liability and related schemes and incorporating quality measure in price controls. The fourth, the form of price regulation, is meant to address those aspects of quality determined by capital expenditures; other forms of service quality regulation, particularly liability and related schemes are also useful in this respect. Selection of the most appropriate regulatory mechanism depends on the characteristics of the product or service as well as on market structure and a country's institutional endowment.

Whatever form of service quality regulation is implemented, it should be closely coordinated with price regulation. Setting and re-setting quality and price controls at the same time and in the same framework of evaluation helps avoid inconsistency and has the advantage of providing the regulated industry with a stable regulatory framework in the periods between periodic reviews (Rovizzi and Thompson, 1995).

Since many water utility assets are located underground and have very long working lives, whatever form of regulation is implemented, the information and enforcement burden on regulators will be large. The regulator must ensure that companies devote sufficient resources to maintenance and improvement and monitor carefully their capital and maintenance spending to keep assets in good condition for adequate levels of reliable service (Kinnersley, 1990).

Regulatory agencies facing utilities with discretionary control over aspects of product and service quality require non-market information, such as consumer surveys, to evaluate changes in prices and quality (Spence, 1975). In the privatized water industry in England and Wales, OFWAT places considerable importance on the involvement of consumers whenever possible in the debate about the standards of service that the customers want and are prepared to pay for, and the water companies share this view (Jeffery, 1994).

Publishing information on quality performance. Requiring companies to publish information on quality performance is simple and inexpensive. It usually provides few incentives, however, for compliance, although it can be a useful complement to other measures. It encourages public and media pressure on any company with a poor performance and may encourage new entry in the industry (Rovizzi and Thompson, 1995). To be more effective, it should be complemented with awareness campaigns intended to inform the public.

Liability and related schemes. Under *liability schemes*, companies are responsible for the nuisances and losses to customers caused by poor service. This approach provides strong incentives where there are private companies for quality improvement, enforcement is decentralized, and customers receive compensation for poor service. Customers may find it costly to make their case, although a number of measures can be taken to reduce these costs, e.g. creating a data base of materials on which citizens may draw to identify and assemble cases, setting up an efficient reporting machinery to facilitate selection of violations and to reduce the costs of bringing a case, awarding the full value of the fees and costs incurred in litigation to plaintiffs bringing effective or useful suits.

Customer compensation schemes or *guaranteed standards of performance* involve the setting of standards of service backed by a system of financial penalties payable in the event of non-compliance either to the government, or preferably if it is feasible, directly to affected customers (Rees and Vickers, 1995). In England and Wales, for example, the "Guaranteed Standards Scheme" (GSS) provides for fixed payments to be made when the company fails to meet certain guaranteed service standards (OFWAT, 1995a). The current GSS provides a flat rate payment of £ 10 (about US$ 15) in respect of each failure to meet the guaranteed standard, except for sewer flooding where the payment is a refund of the customers' annual sewerage charge (OFWAT, 1995s). Payments for some service failures are made automatically; if they are not made within 10 working days of the failure, the customer is entitled to an additional payment. For other failures, claims must be made in writing by the customer.

The main advantages of customer compensation schemes are that they provide for consumer- and fault-specific compensation and their flexibility in the sense that the company is allowed to trade-off changes in service quality against its incremental costs (Rovizzi and Thompson, 1995). This approach suffers from high transaction costs, however, and is more appropriate when quality failures can be easily verified. It seems particularly appropriate for supply interruptions, rationing and similar problems. A regulator does not need to directly observe rationing because it is observable by customers and there would be few disputes because an interruption

typically affects a large number of customers simultaneously. By making compensation penalties sufficiently high, the regulator can make rationing always unprofitable, and thereby essentially force the firm to remain on its demand curve (Riordan, 1984).

Although customers should receive compensation if the service for which they have paid is of poor quality which causes demonstrable damage, loss or inconvenience, the design of compensation schemes should take into account the following factors: (i) exceptional costs - in some cases the application of customer compensation schemes could have a significant impact on the utility's ability to properly carry out its functions, and thus to make improvements to services in the longer term; (ii) exceptional circumstances - the delivery of water-related services is contingent upon external events and it is not cost effective to plan service delivery against every eventuality; and (iii) customer responsibility - it would be inappropriate to compensate customers for losses which have arisen from their own action or inaction (OFWAT, 1995a).

Minimum quality of service standards, as well as service quality standards in general, should focus on those aspects of quality of service for which consumers care most about (Rovizzi and Thompson, 1995). They could be backed by explicit legal sanctions, such as fines or license amendment or revocation, or by implicit threat to revise the regulated price or to impose enforceable quality of service standards (Armstrong, Cowan and Vickers, 1994). Efficient resource allocation requires that standards be set with reference to the benefits of regulation and its costs.

Minimum service quality standards are appropriate for the situations where there are informational asymmetries between supplies and customers, and where there are severe non-linearities in the consumer-benefit function (Rovizzi and Thompson, 1995). They may also be attractive as a public relations exercise. There are also disadvantages with minimum standards, including the difficulty of determining the correct level of service quality, the efficient level of penalty and how to redistribute the fines to consumers (without redistribution, there will be no compensation) and a lack of flexibility as well as of incentives to the regulated firms to improve quality beyond the minimum.

Formal incorporation of quality measures in price regulation. Incorporating a measure of service quality explicitly in the price-control formula or taking it into account implicitly at the regulatory review may include acting to reduce price, profits or revenues when a firm fails to meet quality targets or initiating a regulatory review in the event of service quality falling below some preset levels.

A well-implemented mechanism of this kind would mimic the incentives existing in competitive markets where any arbitrary reduction in quality has a direct effect on the revenues of the firm and it can give strong dynamic incentives to improve the service above the minimum. Including a service quality factor in the price-control formula is a self-operating incentive mechanism, at least until the next regulatory review, hence transaction costs and regulatory burden would be low, and it is flexible because the firm can select the price/quality combination which it finds the most appropriate given the price and service quality constraints, hence its implementation does not depend on the availability of information about the incremental production costs in supplying different levels of quality (Rovizzi and Thompson, 1995).

Including a measure of service quality in the price-control formula does involve regulatory costs incurred in establishing the mechanism, a heavy informational burden and a need for independent monitoring of service quality. Both the definition of a quality index, which implies identifying service quality dimensions and weights, and judgement on the appropriate balance between price and quality in the regulatory formula are not easy in practice and fraught with controversy (Rovizzi and Thompson, 1995). In addition, it does not compensate directly those who have experienced poor service.

The form of price regulation. Any price regulation which guarantees the ability of public utilities to incorporate additional costs of maintaining and improving the quality of service in their cost-of-service and hence to recover these costs in their prices, will presumably encourage such utilities to incur them to a greater extent than a non-regulated monopolist (Kahn, 1988). This means that rate-of-return regulation has attractive qualities when service quality is a capital-intensive attribute (Spence, 1975). Rate-of-return regulation encourages higher capital expenditures and if such expenditures are associated with improvements in service quality, this form of regulation would tend to offset the incentives to reduce quality when the allowable price is fixed (Vickers and Yarrow, 1988). However, if service quality is labour-intensive, this form of price regulation is likely to exacerbate the quality problem because of the Averch-Johnson effect.

In contrast, price-cap regulation typically does not give correct incentives to maintain service quality, on the contrary, the firm has an incentive to under-provide quality, given the particular price level (Armstrong, Cowan and Vickers, 1994). However, the fact that under this form of regulation profits can diverge significantly from normal levels while customers may be less inclined to support the imposition of financial penalties on a firm they think is performing well (Sappington, 1994a), may encourage managers of price-cap regulated utilities to assume more responsibility for giving a good level of service.

In the privatized water industry in England and Wales this problem was addressed by fixing price caps so as to finance the prospective investment expenditures required by each company and OFWAT may disallow the full extent of permitted price increase if a company fails to meet its prescribed investment objectives (Rees and Vickers, 1995). Even more important is the requirement imposed on the DGWS to ensure that companies are able, in particular by securing reasonable returns on their capital, to finance the proper carrying out of their functions (HMSO, 1993). OFWAT works with the quality regulators to check that companies achieve the quality standards allowed for in the price limits on time (OFWAT, 1995h). If companies do not deliver the standards required, the DGWS will reclaim appropriate allowances from them either at a periodic review or by adjusting price limits between reviews at an interim determination.

(iii) Standard setting

Setting standards is a complex and demanding task, as regulators need to make correct cost-quality trade-offs which involve making judgement on consumers' valuation of quality improvements. The guiding principles include: (i) setting standards, as far as possible, to reflect the balance between the social cost of the damage avoided (i.e. benefits) and the social cost of avoiding the damage, including the costs of regulation incurred both by the regulatory agency and the firm; and (ii) consultation with those who have to pay for and abide by them. In practice, however, it is difficult to estimate the public preferences for marginal changes in water or service quality. In addition, the existence of separate regulators for water quality, environmental standards and prices with different responsibilities and powers - the so-called common agency problem - can complicate efficient standard setting.

Standards must be realistic, attainable, well defined, technologically sound, enforceable, and above all, in line with social and economic reality and consistent with providing a reasonable degree of environmental protection. The uncertainty stemming from the adoption of ambiguous, unenforceable and prohibitively expensive quality standards undermines confidence in regulatory policy and government commitment, and distracts regulated firms from the need to achieve compliance at minimum cost.

The technical studies required for the setting of standards, environmental and otherwise, can be contracted to the private sector and there are good reasons to do so. In general, however, self regulation should be avoided. If an industry is allowed to set its own minimum quality standards, it can be expected that these standards may be set too high or too low, but on balance, there is some reasons to expect too high standards to be the more likely case (Leland, 1979). Where the public interest

is very large, the cost of errors is unacceptable and the standards have to be coordinated with other regulation, public intervention in standard setting is called for. A failure of market mechanism, which is due in part to the problem of asymmetric information and that of the lack of competition, means that it is appropriate for governments to determine and enforce standards.

Once standards are set, it is important that the regulator makes efforts to ensure that utilities minimize the cost of reaching them. The important aspects of the issue to be taken into account include: (i) the Averch-Johnson effect; (ii) the asymmetry of information, which requires careful monitoring and certification of expenditure plans; and (iii) the need to ensure that utilities choose the most efficient means of compliance, which suggests the need to pay attention to the feasibility and desirability of setting-up some type of market mechanism for achieving environmental objectives (Armstrong, Cowan and Vickers, 1994).

(iv) The common agency problem

Where a firm faces separate regulators for quality of service, pollution and other environmental aspects, and prices, whose preferences for the various possible actions typically conflict what is generally referred to as the common agency problem can arise (see Holmstrom and Tirole, 1989 and Bernheim and Whinston, 1986). This can create tension between regulators who simultaneously and independently attempt to influence a common agent, such as a drinking water supply company (Jeffery, 1994), and create the danger of inefficient outcomes (see Box 6) as well as of inconsistency and a lack of credibility.

Obviously, higher standards demanded by environmental regulators requiring additional capital and maintenance expenditures have implications for rate setting. If the environmental regulator does not need to consider the costs of achieving a given standard then it will tend to set standards which are too high from the point of view of economic efficiency. Such a situation can arise when the benefits and the costs of regulation (e.g. pollution control or consumer protection) are borne by distinct groups whose interests are represented by different regulatory agencies (Baron, 1985).

On the other hand, the regulation of prices and quality or environmental aspects by the same regulatory agency might give rise to concern that this would give insufficient weight to consumers' or industry's interests. In addition, the separation of economic from environmental regulation helps avoid the conflict of interest, reduces the possibility for regulatory capture, avoids the incompatibility of the different requirements for regulation in the different areas of regulation and allows specialization among regulators.

Box 6

The common agency problem

The common agency problem can arise when a regulated monopolist is subject to regulation by two regulators, e.g. an environmental protection agency and a public utility commission. A study by Baron (1985) illustrates the kind of conflicts that can arise. In this study, an environmental protection agency (EPA), is responsible for achieving an acceptable balance between the damage from pollution and the cost of abatement, and a state public utility commission (PUC), is responsible for pricing electricity on the basis of the total costs of production, including pollution control, and for providing a firm with a fair return on its assets. Any firm will have private information about its production process and hence about the effectiveness of its abatement alternatives.

Although cooperation, i.e. joint regulation of emissions and prices, would internalize the conflicting interests and mandates of the regulators, the distributive consequences of the regulatory alternatives inhibit cooperation (a PUC wants to minimize abatement costs and an EPA does not want cooperation to impede achievement of its abatement objectives).

In a non-cooperative equilibrium, an EPA would set the maximum emission fee enforceable by the courts and mandate abatement standards that are more stringent than the regulators would choose in a cooperative equilibrium. This forces a PUC to respond with prices higher than would be set under cooperation. As a result, abatement is carried beyond the point of efficiency and the output of the firm is lower.

The firm would prefer that the regulators not cooperate because it then earns rents on its private information. Under plausible conditions, an EPA also prefers not to cooperate because it is better able to serve its own mandate if it does not take into account the PUC's interests. Only a PUC prefers cooperative to non-cooperative regulation because cooperation would reduce both the costs of abatement and information costs.

Source: Baron (1985) and (1989).

The potential for inefficiency underlines the need for closer cooperation between the regulatory agencies, for institutional procedures that guarantee collective decision-making, for the responsibilities of regulatory agencies being compatible, and for an explicit duty to be imposed on the environmental regulator to balance costs against benefits, as long as legal obligations are not compromised (Cowan, 1993).

In the privatized water industry in England and Wales, as economic regulator, OFWAT does not decide on environmental policies, but it ensures that decision-makes have all the necessary facts, strives to ensure that costing is available and that sufficient solutions have been considered, and is concerned that companies should be able to plan their investment programmes in a reasonably stable regulatory environment (Booker, 1994). It impresses on the quality-regulating agencies the importance of carrying out adequate economic analysis before they adopt more

stringent standards. OFWAT also impresses on both quality regulators and water companies the need to arrive at efficient solutions in which quality and environmental objectives are achieved in a cost-effective way (Booker, 1994). It also tries to alert customers to the possible impacts of new environmental regulations (OFWAT, 1995d).

The common agency problem is not limited to the possible conflict between economic and environmental regulation. For example, a similar problem might occur where the regulatory bodies for electricity and other energy resources such as gas are dissociated from one another, thus complicating the tasks of medium- and long-term investment planning, design of policies for energy substitution and rational use of energy, etc. (Azpiazu and Vispo, 1994).

(b) The regulation of quantity

Many water-related goods and services form a small but indispensable part of the total cost of the wide range of products in which they are used. As a consequence, the losses from service failure can be very large, in financial, social and political terms, relative to the basic cost of service provision.

Where a utility provides a necessity that consumers cannot readily forgo, as to a greater or lesser extent applies to drinking water supply, sewerage and electricity, it is usually subject to obligations to supply through universal service obligation (i.e. to serve all those who live within the area where it holds itself out to serve, apply for service and are willing and able to pay for it) (Bishop, Kay and Mayer, 1995). Without such an obligation, utilities would not have a motivation to serve when the costs of demand temporarily increase. For the utility industries this requirement sometimes implies that they must provide capital investment in unprofitable areas or must maintain an unprofitable type of service, but more commonly it means that a utility must expand capacity ahead of demand growth (Phillips, 1993). In some countries, utilities are allowed to charge one-off fees to finance network or production capacity expansion when new users are connected.

Although under a universal service obligation, a utility is typically expected to provide service to anyone willing to pay, this is not immediately feasible in many Latin American and Caribbean countries where the level of coverage is low or the supply unreliable and will continue to be so for some time to come. This problem can be met by requiring that the number of connections or installed capacity must expand at a specified rate or by committing the utility to a specific programme of investment. A commitment of this kind, if adequately formulated and sufficiently flexible, should not be unduly costly. One of the advantages is that once the

investment is in place, the potential for enhancing profits by reducing quantity is substantially reduced (Jones, 1994). On the other hand, private investors would require a higher expected return as a compensation for the commitment, and if credibility and commitment were an issue, that return might be very high. The example of Aguas Argentinas, which has won a 30-year concession contract to provide drinking water supply and sewerage services in Buenos Aires, Argentina, suggests that privatization can bring rapid improvements. In less than 2 years, it expanded the drinking water network to 600 000 new residents, eliminating water shortages, increased drinking water production by 26 per cent and improved the reliability of service (Donaldson and Wagle, 1995).

Universal service obligation implies that in the case of an essential public service, the public sector can never wholly abdicate its responsibilities for its operation to the same extent as in other industries, without placing the public at risk. Given that the operator of last resort will always be the public sector, governments should probably consider either to regulate privatized water-related utilities more comprehensively than is traditionally the case, including their debt accumulation, dividend policy, diversification and investment or to forego more comprehensive regulation but charge the privatized firm a risk premium for "public insurance" covering the contingent costs of the public sector intervention should the firm enter into a critical operating condition (Devlin, 1993). An alternative would be to retain a force account capacity to provide a residual means of performing essential functions should the private sector fail to perform its functions (see OECD, 1987).

Public utilities usually also have the obligation to serve all customers on equal terms, i.e. without unjust or undue discrimination among them (Phillips, 1993). The classification of customers for the purpose of rate-making is typically permitted, however, subject to the condition that within each class, the same rate structure must apply. The prohibition of undue preference or discrimination in the fixing of prices has also been interpreted as the requirement to set prices roughly proportional to attributable costs.

(c) Regulating investment[*]

Many of the benefits of private sector participation in water-related pubic utilities result from the provision of protection to necessary, but politically dispensable, water-related investments from general budgetary pressures. It also provides a means of tapping the greater pool of private capital to help finance them. The direct object

[*] This discussion draws on Cowan, 1993, Helm, 1993 and 1994b and Vickers and Yarrow, 1988.

of regulation is usually pricing policy, the effect of regulation on social welfare depends critically, however, on the investment behaviour that price regulation induces in regulated firms (Vickers and Yarrow, 1988). Given the nature and technological characteristics of most water-related goods and services, advantage in competition in production and supply are likely to be small unless there is competition in investment.

Where prices are regulated, regulatory agencies must monitor carefully the capital and maintenance spending of the regulated firms to ensure that they make the investments allowed for in the price limits on time and achieve the expansion, quality and other targets for which the investments had been approached. The need for close monitoring is underlined by the capital intensive nature of most water-related public utilities which provides scope to evade the constraints imposed by price regulation by reorganizing their investment profile to enhance short-term financial performance at the possible expense of longer-term efficiency and prospects (Bishop and Kay, 1989).

(i) Commitment, regulatory risk and investment

Worldwide, there is no shortage of capital to make the necessary investments in the water sector; "there is, however, a shortage of confidence" (Graham, 1995b). An adequate supply of private finance to the privatized water sector will only be forthcoming, if investors are confident that: (i) their investment will not disappear though direct expropriation or through many small regulatory actions that are tantamount to a *de facto* expropriation; and (ii) they will earn a rate of return on the capital invested in the sector which is commensurate with the risk they take. Potential investors need government commitment to respect, over the long run, their property rights, the rules and regulations governing tariffs, entry conditions, and expansion plans.

The problem of commitment "arises from a fundamental asymmetry: the regulated price is flexible but the regulated firm's capital stock is not" (Besanko and Spulber, 1992). Although an incentive to act opportunistically exists in any multiperiod relationship, "opportunism may be more characteristic of the policies of public agencies than of private parties because although courts will prohibit inefficient breach by private parties they generally will not proscribe revisions of policies by regulatory or administrative agencies. Instead courts tend to restrict their review to procedure, process, and consistency" (Baron and Besanko, 1987).

Limited commitment powers involve both political and regulatory risks. Political risk arises from potential future radical changes in general government

policy and regulatory risk arises from uncertainty surrounding the regulatory rules and regulatory environment (Grout, 1995). A particular feature of regulatory and political risk is that, unlike other risks, they are asymmetric around the expected return, i.e. investors perceive them as being mostly of a negative nature.

The potential for underinvestment is significant because water-related utilities are highly capital intensive, and most assets are specialized, location- or site-specific, and extremely durable with slow capital depreciation. Much of the investment is long-term and sunk and this can create a temptation for a regulator to ensure, once capital is irrevocably sunk, that prices are kept artificially low, i.e. only cover future avoidable costs, marginal operation and maintenance costs and the return on non-specific assets, so that there is no profit margin left to compensate the firm for its prior investment. In such circumstances a company may be willing to continue operating, but not to invest at the efficient levels, because exit does not allow it to recover any of its investments, while shutting down and deploying its assets elsewhere involves additional costs (Guasch and Spiller, 1994). The existence of asymmetry of information between regulator and firm, however, may mean that the regulator is unable *ex post* to set price equal to average avoidable costs and this could mitigate underinvestment incentives (Besanko and Spulber, 1992).

Such *ex post* opportunism on the part of regulators can take various forms, but their effect is always to claw back company earnings reducing the value of the initial regulatory contract. Some of the more notable include interim price reductions; excessively slow depreciation; arbitrary changes in regulatory lag, quality or other aspects of service enhancements, without compensating price increases; disallowing recovery of supposedly "imprudent" investments; increased investment requirements, without compensating price increases; and market-share reduction (on the basis of Helm, 1994b and Salant and Woroch, 1992).

This type of expropriation may be profitable for a government if its direct costs (e.g. reputation loss *vis-à-vis* other utilities, lack of future investments by utilities) are small compared to the short-term benefits (e.g. achieving re-election by reducing utilities' prices or attacking a (foreignly owned) monopoly), if the indirect institutional costs, such as disregarding the judiciary, are not too large, and if the government's horizon is relatively short (Guasch and Spiller, 1994). The fact that (i) utilities' customers constitute a large proportion of the population, and are mostly captive and outspoken; and (ii) water-related projects, because of their social, economic and environmental implications and because they serve a lot of people, are highly visible and often serve as powerful political tools which can make a difference in the elections of public officials, reinforces the incentive for opportunistic behaviour (Guasch and Spiller, 1994 and Lyon, 1995).

It is essential, therefore, to develop a stable regulatory environment to encourage and maintain private investment in water-related services. Unless there is a stable regulatory environment, the rational fear of *ex post* opportunism by governments will deter efficient investment in sunk cost assets. The magnitude of the bias to underinvest depends on the nature of the assets involved, including the degree to which costs are sunk, the speed of depreciation, the rate of discount and the method used to finance investment, among other factors (Salant and Woroch, 1992).

Since the costs of investment are in part determined by the risk involved, any uncertainties associated with regulatory policy will raise the cost of capital to regulated firms. The immediate effect will be an upward pressure on tariffs. Uncertainty will also affect both the magnitude and composition of the investment programme, including the extent of technical innovation. This could also lead to an inefficient technology choice on the part of private investors providing a bias towards less capital intensive types of technology. Such uncertainty can also encourage the firm to seek to improve its short-term performance at the expense of the long-term one. Attempts to secure private sector participation, in an uncertain regulatory environment, would tend to attract mainly those entrepreneurs who have greater lobbying power or with greater willingness to take risks.

If a government cannot commit itself to a confined regulatory mechanism, private enterprise will not perform better in terms of the public interest than does public enterprise, because risk averse managers would have an incentive to make as much profit as possible, but not to invest (see Willig, 1993). If governments want to motivate private investment, it is necessary to design institutional arrangements to limit their own ability to behave opportunistically (Guasch and Spiller, 1994). Otherwise, private investment will not be the best way to finance water-related projects and the public sector might have to assume responsibility for investment. In these cases, service, management and lease contracts become the appropriate form of private sector participation.

Measures to reinforce private sector confidence

The only secure route to private sector confidence is a history of rational government committed to policies encouraging private investment in public services. Governments must demonstrate that they do not indulge in *ex post* opportunism. There are, however, some policies which governments can adopt to reinforce private sector confidence. For example, deregulating to the maximum, i.e. allocating decision-making authority to the firm responsible for most of the specific investments. This has the advantage of reducing the possibility for government or

regulatory failure, but its disadvantages are the inefficiencies arising from market failures. The efficiency of this approach also will depend on the strength of the commitment not to introduce regulation in the future.

There are also what can be called technological alternatives which involve structuring the operating methods and technologies in the regulated industry to limit the incentives for opportunistic behaviour by a government or regulator (Sappington, 1994a). For example, since durability increases the regulator's incentives for opportunistic behaviour whereas such behaviour is not possible where assets are highly mobile, one solution would be to limit highly sunk expenditures on plant and equipment. "Compromising production efficiency may be a small price to pay for strategic stability" (Salant and Woroch, 1992).

The more effective alternative is, however, to begin with long-term regulatory contracts which guarantee the right of the regulated firm to earn a fair rate of return on investments. To be effective, these contracts must be credible and backed by guarantees limiting detrimental modifications. This requires setting out the rules of the regulatory scheme in detail and ensuring that past regulatory promises are honoured in future proceedings. It is difficult, however, to ensure regulatory stability. The basic problem is that regulators and governments in general cannot impose binding obligations on their successors.

In Chile and Argentina, very specific regulatory laws have been adopted and regulatory discretion has been strictly limited. The private sector has been investing massively in public utilities, particularly, all segments of the electricity sector, but in drinking water supply and sanitation, as well. It is, however, generally difficult to write and enact very specific regulatory laws, in part because some contingencies cannot be effectively anticipated. In addition, having all the rules set out in detail precludes the use of flexible regulatory schemes that require administrative discretion to be feasible and has an offsetting cost in terms of the reduced flexibility to adapt to changing circumstances. It may also encourage political interference in the regulatory work.

Another alternative is to specify in the transaction-specific contract documentation (e.g. operating licence) all regulatory procedures and parameters. The use of contract law requires a capable and independent judiciary to arbitrate disputes between the government and the utility. Specifically, courts must view licenses as contracts, be willing to uphold them against the wishes of the executive and not grant it too much freedom in their interpretation (Guasch and Spiller, 1994). For the success of this approach, it is essential to provide a long-term assurance to the private operator that the regulator will respect the letter and spirit of the contract and related laws. The use of contract law has important advantages in that:

(i) it provides a strong guarantee against opportunistic behaviour since contracts cannot be changed unilaterally; and (ii) it provides a means to institute regulation gradually, adapting the regulatory framework to the changing conditions and needs of the country, a factor particularly important in countries with little experience in formal regulation.

The main disadvantage of using contract law is that it may introduce rigidities in the regulatory system. Contracts give the operator substantial bargaining power, limiting the flexibility of the regulatory framework, which would be undesirable if there is a genuine need to amend the license (Guasch and Spiller, 1994). Going too far down the road to explicit contract would in effect transfer the responsibility for regulation to judges or tribunals, entrusting the responsibility for determining the return on capital to the judiciary, a task which they tend to be poorly equipped to undertake (Holtram and Kay, 1994). Reliance upon project-specific rules embodied in a contract also carries dangers if a government lacks the skills and bargaining leverage to ensure that the resulting contract fairly balances public and private interests (Stewart-Smith, 1995).

The use of contract law as a means of restraining regulators and ensuring regulatory credibility is more appropriate when privatization is limited in scope, e.g. relatively small concessions, build, operate and transfer (BOT) projects and independent power producers or producers which operate under a contract with state-owned utilities, but is much less appropriate when privatization is more comprehensive - involving, for example, divestiture of major utilities. The latter calls for a regulatory agency being created because it is impossible to pre-specify the complete terms of regulation in one or more contracts (Tenenbaum, 1995).

Credibility can also be enhanced through the use of domestic or international guarantees and by building up regulatory reputation and policy credibility. The regulator can overcome the credibility problem by building up a reputation for fair treatment, including a fair rate of return on investments. The longer a government is involved in contracts with private investors, the more the incentives to exploit the sunk nature of their investment will be reduced by reputational effects.

External guarantees through the participation of multilateral credit agencies, such as the International Bank for Reconstruction and Development (IBRD) and the Inter-American Development Bank (IDB), can help address the problems of limited commitment powers of governments and regulators. The World Bank has recently created stand-alone guarantees for various sovereign risks, including government regulatory actions (Tenenbaum, 1995).

Although external guarantees can help reduce regulatory risk, they may also have unintended side effects that undermine successful private sector participation: (i) the guarantees might become excessively broad undermining the efficiencies obtained from investors bearing the risk of a project's failure; (ii) since there is no efficient market for regulatory risk, the guarantee might be difficult to price and if mispriced, might send incorrect signals to investors and increase the costs to consumers; (iii) excessive guarantees might reduce, rather than enhance, credibility; and (iv) since guarantees are not free and government resources are limited, excessive guarantees might delay, rather than speed private sector participation (World Bank, 1995).

Finally, it is important to define the regulator's authorities so as to leave as little discretionary power as possible. Since social objectives are notoriously difficult to define in operational terms, social obligations imposed on the regulator should be kept to the minimum required by economic efficiency. It is equally important not to curtail the powers of the regulator too much, however, because the protection of the public interest may require changes in the initial framework. There is a need to find a proper balance between the legitimate interests of the private operator and those of the public.

The effects of price regulation on investment

The long asset lives in the water industry mean that the rates of return on new investment will be mainly a function of future regulatory decisions rather than of the decisions made at the time of privatization (Vickers and Yarrow, 1988). In the absence of clear guidance on the long-term conduct of regulatory policy, the uncertainty associated with future public policies can provide a strong incentive for underinvestment.

Properly interpreted, rate-of-return regulation - and its inherent promise that utility investors will earn a "fair" rate of return - can be viewed as "a form of long-term, incomplete contract with guarantees against capital expropriation" (Yarrow, 1991) and hence as a means of commitment that addresses the underinvestment problem (Greenwald, 1984). On this view, the rate-of-return regulation, as implemented in the United States, is attractive because it entails a commitment, which has juridical backing and historical precedent, that a fair return on investment will be earned (Rees and Vickers, 1995). The Averch-Johnson effect reinforces these incentive properties.

Price-cap regulation has serious drawbacks in this respect because it fails to provide long-term guarantees as to the decisions made at the regulatory review.

Unless clear guidelines binding the decisions taken during regulatory review to ensure a reasonable rate of return are laid down, or emerge from precedent, the cost of capital will increase and there will be an incentive for the firm to underinvest. These guidelines, however, must necessarily embody an explicit feedback from cost reduction to eventual downward tariff adjustment and this would negate some of the superior incentive properties claimed for price-cap regulation (Beesley and Littlechild, 1989). This underlines the need to design the framework of regulation accordingly. In the privatized water industry in England and Wales, this problem is addressed by the requirement that OFWAT must determine the price controls it sets for water companies by reference to an obligation to ensure a reasonable return on capital (Holtram and Kay, 1994).

Although pure price-cap regulation may fail to offer the same type of long-term commitment which the rate-of-return regulation, as implemented in the United States, is considered to provide, the decisive influence is likely to depend more on the structure and behaviour of institutions, both regulatory and political, than on the form of price regulation *per se* (Rees and Vickers, 1995). In both cases there remains the question of whether political institutions are capable of offering secure long-term commitments to regulated firms (Yarrow, 1991).

The incentives for opportunistic behaviour tend to be particularly pronounced when realized returns on incentives are unexpectedly high (Sappington, 1994a). This implies that price regulation can be designed to make private investments less susceptible to expropriation. For example, since under price-cap regulation profits can diverge significantly from normal levels, rate-of-return regulation can be expected to provide more protection against expropriation. If price-cap regulation is used, it would be preferable to combine it with profit sharing arrangements. Finally, efforts should be made to make the link between increased earning and increased effort, diligence and creativity on the part of the regulated firm as apparent as possible to the customers so that they understand that both they and the firm are better off under a well-designed high-powered price regulation than they would be in its absence (Sappington, 1994b).

The Chilean electric power industry affords an interesting example of an intent to address the problem of ensuring an adequate supply of private finance to a capital-intensive industry through a combination of regulatory and market mechanisms. In Chile, the electricity pricing system provides both for regulation of prices and for large consumers to freely negotiate price with any generation company. The regulated prices for bulk power sold to distributors are set at each node (the place of transfer from the national transmission grid to the distributor) of the high voltage transmission system. Node prices cannot vary by more than 10 per cent around the average price in the non-regulated contracts. The intention of

the regulation is that the private sector will invest in electricity generation to the extent that new projects provide a return on capital compatible with the level of risk (Bitran and Sáez, 1994). If investments in new generation are not made, the future short-run marginal cost will increase, and this will lead to higher node prices, which in turn will give the incentive to expand capacity when demand increases. Under this scheme, most investment choices and decisions are left to the private sector.

Other sources of regulatory risk

Other sources of regulatory risk which could give rise to underinvestment include environmental policy (e.g. uncertainty about the potential liability for environmental damages either in the future or those caused by the operation of the former state-owned enterprise), policy concerning liberalization and industrial structure, the risks of (re)nationalization on unfair terms and anti-competitive behaviour of state-owned enterprises. These risks can be minimized by credible commitment not to change to the detriment of the regulated industry the regulatory regime which guarantees the right of the regulatees to earn a fair rate of return on their investments.

In the United States, for example, private investors "do not believe that water utilities are potentially lucrative economic properties at present because of the regulatory overhang of the unissued standards for many of the contaminants listed in the Safe Drinking Water Act" (Rogers, 1993). The 1986 amendment to the Safe Drinking Water Act, requires the Environment Protection Agency (EPA) to develop maximum levels for eighty-three new contaminants by the end of 1989 and to develop at least twenty-five additional primary standards every three years (Phillips, 1993). These new standards raise a number of problems for water utilities, but perhaps the most important of them "is the fact that few, if any, of the contaminants were taken into account in designing currently installed plants, with the result that both the ultimate treatment processes and final costs of meeting the new standards over the coming years are unknown" (Phillips, 1993).

A closely related problem is that of the asymmetric treatment of uncertainty by regulators, i.e. regulators tend to apply a stronger standard of scrutiny to extraordinary gains forcing the firm to pass on these gains to customers, than to extraordinary losses forcing the firm to bear a large part of the cost of bad decisions (Train, 1991). This asymmetry can distort the firm's incentives and induce it to make decisions in a way that ultimately works against welfare maximization (e.g. the firm may be induced to undertake projects that are too conservative).

(ii) The structure of investment

One effect of privatization will be to increase significantly the discount rate applied to investment projects as the discount factors used by governments are usually low, because unlike private investors governments can spread the risk over the entire population (Vickers and Yarrow, 1988). Allowance for regulatory risk may also affect the discount rates used in investment appraisal by private investors.

There is a tendency for the public sector, facing lower discount rates, to favour long-life, capital-intensive projects, but the funds available are typically rationed and some projects do not materialize while others come to only a slow conclusion (Kay, 1993). The private sector, while it tends to favour shorter-life, lower-capital cost options, ensures that capital is available for any project the meets the rate-of-return criteria.

Privatization can affect the choice of technology. For example a higher rate of discount implies a bias toward less capital-intensive technologies and fuel choices in electricity generation. Thermal power may become the technology of choice rather than hydroelectric generation. Changes in the structure of capital flows with privatization are not likely to be limited to hydroelectricity generation. Change can be expected wherever there are less-capital intensive technological solutions and where there is competition from less-capital intensive substitutes. Irrigation *vis-à-vis* rain-fed agriculture, and to a lesser significance water transport, versus rail, road or air, are other areas where privatization could produce important changes in the structure of investment.

These considerations do not mean to say that governments should interfere with technology choice, although there could well be some instances when some form of regulatory intervention is warranted, rather their concern should be to know if the adopted technology "is the optimal investment choice or if it is the outcome of a bad regulatory system which has lost any credibility to guarantee reasonable rates of return for long run investments" (Laffont, 1994b) or some other deficiency of the regulatory framework. If a government decides to use subsidies to encourage the private sector to follow a specific investment path, attention should be paid to the need to ensure that any subsidies are channelled to the most efficient companies. Moreover, subsidies should not be hidden in preferential prices, regulatory concessions or other privileges, rather they should be awarded in such a way that they are explicit and easily accountable to the public.

One example of measures of this kind is the Law to Encourage Private Investment in Irrigation and Drainage Works (Laws Nº 18.450 and 19.316) in Chile. Chilean agriculture is highly dependent on irrigation, but almost 40 per cent of the

irrigated area receives water intermittently due to deficiencies in the conveyance and distribution infrastructure and other problems (World Bank, 1994b). Under the Law to Encourage Private Investment, the government may reimburse up to 75 per cent of the cost of studies, constructing or repairing irrigation or drainage works, as well as private-sector investments in mechanical irrigation that increase the irrigated area, improve water availability in an area of short supply, improve water application efficiency, reclaim poorly drained or waterlogged land for agricultural production, etc. (Chile, 1985 and 1994). Funds, up to a maximum of approximately US$ 350 000 for any one proposal or twice that for projects presented by water users organizations are allocated on a competitive basis. Proposed projects are ranked with priority given to those with a higher proportion of total costs contributed by the beneficiaries, a larger benefitted area, and a lower project cost. The subsidy is paid only once works have been completed and duly certified. The law has been well-received by farmers (World Bank, 1994b) and competition has reduced the level of subsidy (UN/ECLAC, 1995a).

(d) Creating a consumer constituency

Giving consumers, both individuals and businesses, a voice in the regulatory process, so that they can present their views and be informed of the decisions, can make utilities more responsive to customers, reduce the risk of regulatory capture and increase accountability of regulatory authorities, as well as make the regulatory process more effective. It is also desirable to require public disclosure of relevant information, including periodical publication of key indicators of utility performance. Consumer participation should be effective but not undermine the private operators' confidence in the stability and impartiality of the regulatory system (Kessides, 1993). Excessive consumer involvement not only can make the process slow and cumbersome, but also encourage cross-subsidization.

For regulatory bodies, consumers are a useful source of information which otherwise they have only limited means of acquiring. Consumers are usually the best monitors of service quality and reliability. Consumer involvement in the regulatory process supported by requirements for public disclosure of relevant information will also make utility companies, both private and public, more responsive and accountable to customers and less subject to capture by interest groups. In investment planning, consumer involvement can promote a demand orientation to investments, and consequently greater commercial viability (Triche, 1993). In addition, regulatory agencies can employ consumer feedback to motivate suppliers to provide high-quality service (World Bank, 1994a). Consumer involvement in regulation is especially important in those services in which customers lack the means of exerting pressure to perform or to express personal preferences to suppliers.

For the private service provider, consumer involvement can be not only an extension of public relations policy, but a critical factor for financial well-being because good customer relations can be vital to dissipating the political pressures on regulatory bodies, particularly during elections. Greater consumer participation can help create acceptance of the higher tariffs that often accompany sector reform and private sector participation and build confidence in the changes (Triche, 1993). Private utilities increasingly realize that, it is not the regulators who are deciding the permissible rates to charge and service or environmental quality standards, but the customer (Graham, 1995a). In addition, relations with consumers provide private utilities with the information, including critical feedback on operation and maintenance, they need to make good business decisions and reinforce community trust in the company. Various means can be used to facilitate the dialogue, including public forums, one-on-one meetings with local leaders and the press, customer round-tables and written communications.

The approach of due process, open hearings and rights of appeal adopted in the United States has advantages in that all legitimately interested parties have the opportunity to participate and there is openness and transparency in the decision-making process (Stewart-Smith, 1995). Rates are determined in the context of a public hearing process in which all relevant information is made public and in which all interested parties, including consumers, may participate (Triche, 1993). Consumer groups testify regularly in these public hearings; and in some states, public service commissioners are elected by popular vote. During the public hearing, participants submit oral and written evidence to the tribunal and at the end of the hearing, the tribunal issues its decision, with reasons and rules in all questions asked (IEA, 1994). Although under this approach the regulatory process tends to be adversarial and decision-making is costly, in terms of both money and time, to say nothing of the costly rent-seeking on the part of interest groups, the gains obtained from transparent and open decision-making are seen by many experts as outweighing those costs (Stewart-Smith, 1995).

In the privatized water industry in England and Wales, OFWAT has set up Customer Service Committees (CSCs) in each of the 10 water and sewerage companies' areas of operation (Myers, 1995). They are independent of the water industry and their members are appointed by the DGWS. The committees identify the main concerns of water consumers and represent their interests both to the water companies and to the DGWS; closely monitor the services water companies provide and deal with customer complaints ensuring that they are satisfactorily investigated; and advise and report to the DGWS on particular issues affecting customers (OFWAT, 1995c and 1995e). The committees meet in public with company staff to discuss matters of concern to customers (Booker, 1994). They also advise the DGWS on the customer dimension of various proposals such as changes

in charges, levels of service, etc. (Banyard, 1995). Consumers are also involved in the price review process. For example, as part of a recent price review, the companies conducted extensive public opinion surveys of consumer preferences and their willingness to pay (Jeffery, 1994).

In March 1993, the DGWS set up the OFWAT National Customer Council (ONCC) - its members are the Chairmen of ten regional CSCs and the DGWS - to strengthen the representation of water customers' interests (OFWAT, 1995a). The Council is a non-statutory body; its role is to formulate the views of customers on matters of national importance and to represent these effectively at all levels of regulatory decision-making (government, the European Commission, etc.).

Organising effective consumer involvement in the regulatory process will probably take time in most Latin American and Caribbean countries. In general, water management in the region has been characteristically highly centralized within the public sector and in the national governments (UN/ECLAC, 1991 and 1994a). One consequence has been the prevalence of national institutions with responsibility for a single water use. These highly centralized systems of service delivery have been largely unresponsive to citizen demand and have been subject neither to market nor political tests of responsiveness (Peterson, 1991a). As a result, most citizens have never had to face the realities of budget-constrained service choice, i.e. the fact that water-based services are not free but have to be paid for, and that the choice of service level should be made collectively and rationally in light of the costs and benefits to the community at large. As a result, citizens tend to "demand" free or far better service than is realistic at a given price level and than they are prepared to pay for and blame central government bodies when the level of service they demand fails to materialize (Peterson, 1991a).

Greater private sector participation tends to stimulates greater consumer involvement. In Mexico, for example, the four contractors in Mexico City came rapidly to the conclusion that they would need to engage in an aggressive public relations exercise to educate the consumers about the social and economic importance of water, water conservation and contractor activities which required door-to-door visits for meter installation and bill distribution (Richard and Triche, 1994). This has led them to establish the Foundation for Water Conservation in Mexico, a not-profit water conservation fund, as the basis for these public relations activities.

B. Structure regulation

The purpose of structure regulation is to introduce changes in the organizational structure of an industry so that it approximates more closely the structure needed for competitive behaviour. The structure of an industry largely determines the conduct of its member firms. In the case of monopolistic public services, the regulation of the structure should seek to facilitate effective conduct regulation where competition cannot be relied on to ensure socially desirable outcomes. Structure regulation must take into account many factors including, the technological characteristics of the industry, informational asymmetries, coordination requirements, and transaction costs (see Table 1).

Table 1

Technological and coordination characteristics of the water sector

Activity	Economies of scale	Degree of sunk costs	Degree of coordination necessary
Hydroelectricity	Moderate	High	Very high
Irrigation			
• terminal system	Low	Low	Low
• diversion and distribution systems	Moderate	High	High
• groundwater systems	Low	Varies	Low to moderate
Water transport			
• Piers and harbour	Moderate	High	High
• port equipment	Low	Moderate	Low
• ships	Low	Low	Low
Drinking water supply			
• piped	High	High	High
• non-piped	Low	Low (except well)	Low
Sanitation			
• conventional sewerage	Moderate	High	High
• other	Low	Low to moderate	Low to moderate

Source: adapted from Kessides (1993).

Structure regulation largely dictates the nature of conduct regulation. Failures to isolate the natural monopoly elements and to create adequate competition can considerably complicate conduct regulation and make its task more demanding and its scope broader than necessary. Any failure will also impose on regulators the task of trying to compensate for the deficiencies in structure through more intrusive conduct regulation. Inappropriate industrial structure is one of the main causes of regulatory failure and competition is the best form of control.

The opening of markets to competition requires an approach which permits participants to adapt to the new circumstances. It is difficult to move from a nationalized monopoly to a competitive industry in a single step, even in industries without barriers to competition. In monopolistic industries, the regulator needs the authority and duty to ensure the success of the transition process and to remove, as far as possible, the obstacles to competition without disrupting supply. The mere repeal of the statutory monopoly, however, is not always sufficient to ensure effective competition, especially where the incumbent retains significant market power and has at its disposal a range of instruments of strategic entry deterrence and of exit inducement.

In restructuring any water-related utility to allow private sector participation, the first step is to break up the monopoly of the public sector over service provision, including the elimination of any discriminatory treatment against the ownership and management of water-related utilities by private or foreign companies. It is equally vital to eliminate distortions in the overall incentive environment (tax regime, labour laws, import and foreign investment regulations, etc.) and any excessive regulations and restrictions which inhibit private sector participation.

The second step is to create a credible and stable regulatory framework which guarantees a fair rate of return and protects against anti-competitive behaviour of state-owned enterprises. There must be a level playing field between public and private companies. This can be difficult to achieve because the private contractor's costs are often different from those taken into account for provision by the public sector. Private service providers have to recover all their costs as well as pay taxes and make a reasonable profit. Public utilities, in contrast, often operate at a loss, receive subsidies in the form of grants, concessionary loans, use of public land, staff time and other resources, usually do not pay taxes, and receive abundant assistance in project planning, design, and financial packaging from the external lending institutions (McCullough, 1992). Competition will be unfair unless public utilities are placed on a non-subsidized, full-cost recovery basis.

Aspects of the broader legal and regulatory environment for public works can also act as significant barriers to private sector participation and especially

investment in the water sector (Richard and Triche, 1994). For example, accounting laws and practices, laws governing construction contracts, public works laws and conventions, etc. may be inappropriate for private sector participation and should be carefully reviewed and, if necessary, amended or modified. The administrative burden imposed on private firms in complying with administrative rules and regulations can be a significant obstacle. It should be minimized as much as possible.

1. Vertical and horizontal restructuring

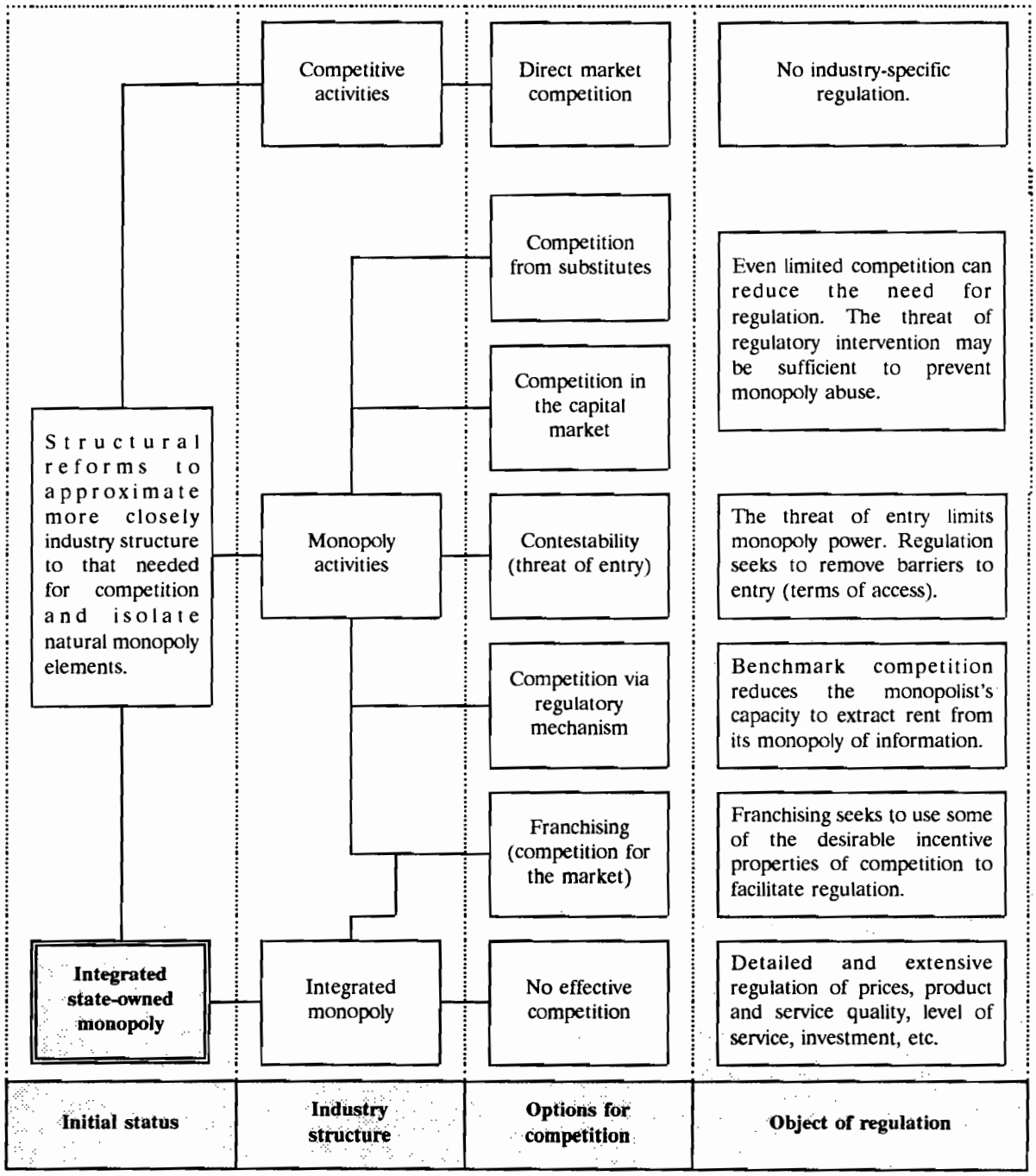
As a matter of general principle, public policy should seek to isolate the natural monopoly elements in an industry and to prevent the firms entrusted with activities with natural monopoly characteristics from extending their monopoly powers beyond the segment of the market where these characteristics exist (Vickers and Yarrow, 1988). This objective can be achieved by detaching, by means of restructuring or contractual arrangements, the potentially competitive activities from those which are natural monopolies or characterized by other categories of market failure, and opening them to various forms of competitive provision (see Figure 3).

When sunk costs are not pervasive in an industry, but rather are centred in a particular sector of its operation, "by isolating the activities with which the heavy sunk costs are associated, their damaging consequences can be quarantined" (Baumol, Panzar and Willig, 1982). Recent advances in economic theory and technological innovations have contributed to the understanding that some water resource development activities commonly regarded as natural monopolies or characterized by other categories of market failure in fact "bundle" together the activities in which market failure is not important with those in which it is. Many elements of market failure inherent in the provision of water-based services are associated with some, very specific, elements of market structure and do not occur equally in all parts of a water management system. The rest of the system comprises artificial monopoly, and therefore the appropriate policy response is the application of general competition and anti-trust policy.

The most common firm in water-based services is an integrated utility responsible for all aspects of service provision in the area under its jurisdiction. For example, the provision of network facilities, whether for drinking water supply, sewage or electricity, exhibits scale economies of such significance that they can be regarded as natural monopolies, but these economies are less important in the case of water extraction and treatment, wastewater treatment and electricity generation, and hardly exists in certain drinking water supply, sanitation and irrigation technologies.

Figure 3

Functional separation increases the options for competition and facilitates regulation



Source: adapted from World Bank (1994a).

The problem with the integrated model is that a market failure in the provision of one service may allow its provider to gain an unfair advantage over other firms in the services which are potentially competitive. Functional separation promotes competition by separating out - to the extent permitted by economies of scale and scope - the potentially competitive elements from those in which competition is inevitably imperfect. It seeks to leave the maximum number of operations to the free market and to limit industry-specific conduct regulation to the segment of the industry that is inextricably associated with heavy sunk costs.

Other potential benefits of functional separation include expanding the domain of economic activity in which there is effective competition, increasing the spectrum of opportunities for private sector participation (e.g. by increasing the scope for franchising), reducing the asymmetry of information between regulator and firm, and improving the quality and quantity of the information available to the regulator. It should improve management accountability and increase efficiency by allowing operators to specialize provided that adequate incentives and channels for communication and coordination are incorporated into the institutional design.

Functional separation is, however, by no means a panacea. For example, vertical or horizontal integration which apparently reduces competition may also raise efficiency. The potential benefits of structural reform may also be counter-balanced by other concerns such as the encouragement of a higher rate of service expansion and the achievement of higher service quality. To decide whether and how to effect separation, many factors need to be carefully analyzed, such as technical, technological and economic constraints to separation and the legacy of history and institutions. Attempts to separate closely interdependent activities can impose high costs on the sector, including the loss of the economies of scale and scope for each firm as its size and service area fall and the costs of sector restructuring, which need to be carefully weighted against the potential benefits of cost-minimizing behaviour under competitive pressure.

The network characteristic of most water sector activities raises the possibility that the efficient operation of the system as a whole will not be achieved without adequate mechanisms of central coordination. This can impose high transaction costs as the coordination between several independent and rival firms is inherently more difficult and costly and less effective than within a single organization. The experience of successful integrated organizations questions the wisdom of excessively dismembering the integrated production, particularly where integration involves significant technological and transactional economies, and suggests that undue fragmentation can lead to serious misallocation of resources and over-investment. Fragmentation of responsibilities for planning, investment, operations, maintenances,

and debt services may lead to lack of accountability and inefficiency because actors do not have an appropriate level of control over decisions and actions that affect their efficiency (Triche, 1990).

Where economies of scale and scope are significant for a relevant market size, water sector services can be provided more economically by a single supplier and separation will raise the costs of service provision (see Figure 4). On the other hand, the existence of potential benefits is not sufficient to ensure that they will be effectively realized under monopoly provision. It is possible that the inefficiencies resulting from the sacrifice of economies of scale and economies of scope would be more than off-set by efficiencies resulting from a competitive market structure and advantages of flexibility and proximity to clients that smaller organizations usually enjoy. Large organizations suffer from organizational diseconomies of scale. In the real world where a monopoly without external pressure usually undertakes only limited cost minimization activity, the introduction of competition, even in a naturally monopolistic industry, could result in lower costs.

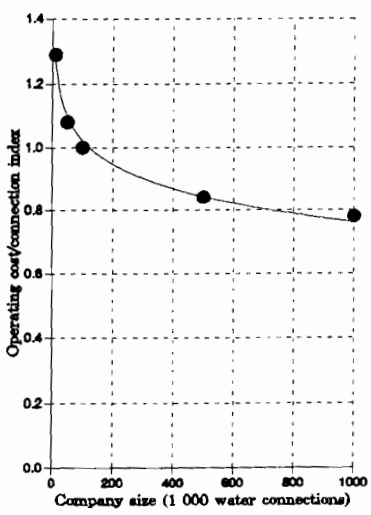
To the extent that effective competition can be established, in the long run the costs of making wrong separation decisions about the initial post-privatization industrial structure may not be too severe (Vickers and Yarrow, 1988). In theory at least, the subsequent evolution of market structure, through mergers, new entry, division, takeovers, etc. will take care of the problem. This underlines the importance on injecting as much competition as possible in the water sector at the moment of privatization. Unfortunately, the underlying technological and market conditions of many water-related activities are such that there are limits to substantially increasing competition, as in drinking water supply and sewerage, but in others, particularly in hydroelectricity generation and, possibly, wastewater treatment, there are greater possibilities.

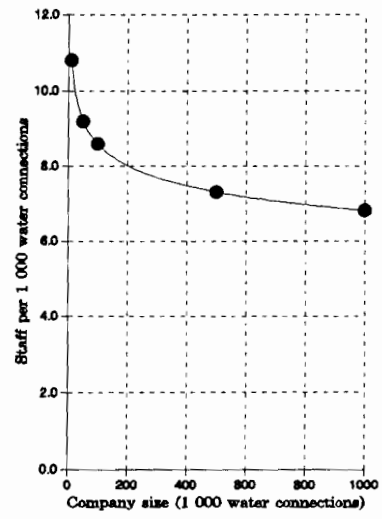
(a) Horizontal restructuring

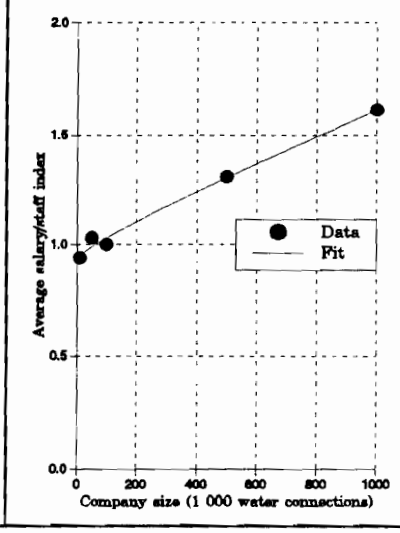
Horizontal separation breaks up, or unbundles, firms by markets - by geographical regions, by service categories or by individual units - creating entities which directly or indirectly compete with each over. Typical examples of horizontal separation are the subdivision of national drinking water supply and sewerage, power or irrigation companies into state, provincial, regional or other units. The fact that in many Latin American countries, the pre-privatization water sector has been already regionalized or is in the process of regionalization, facilitates horizontal separation (see UN/ECLAC, 1991, 1994b and 1994c).

Figure 4

Economies of scale in the operation of drinking water supply and sewerage systems







An analysis of operating indicators of 36 water supply and sewerage companies in Brazil indicates that there are important economies of scale in the operation of water supply and sewerage systems. This conclusion is supported by data from other Latin American countries, Western Europe, U.S.A. and Canada.

Large companies are in a better position to capture the economies of scale present in the construction of large works (water intakes, water and sewerage treatment plants, etc.).

Moreover, the data indicated that while operational costs per connection decreased with the size of the company, average salaries rose. Large companies, therefore, are able to attract more competent personnel, which in turn allows them to operate at a higher efficiency level to offset larger unit labour costs.

There is strong evidence that drinking water supply and sewerage services in communities with population of less than 150 000 to 200 000 (20 000 to 40 000 water connections) can be provided more efficiently and at a lower cost if they are managed and operated by regional companies.

Large and centralized national organizations are not an optimal solution. Experience during the 1960's and 1970's in Argentina, Colombia, Mexico and other countries indicates that central agencies stretched managerial capacity to the point where gross service inefficiencies were readily observable.

Source: Yepes (1990a) and (1990b).

Direct product competition. The horizontal separation may lead to direct product competition, as in hydroelectric generation. Where horizontal separation leads to the emergence of multiple service providers which have to compete with each over, the need for conduct regulation dissipates. Increased competition will also improve the efficiency of any state-owned enterprises that may remain in the sector. Empirical studies suggest that the relative inefficiency of publicly owned enterprises stems largely from the isolation from effective competition rather than the public ownership *per se* (Caves and Christensen, 1980).

Even limited competition is usually desirable because it reduces the need for conduct regulation and enhances its effectiveness by improving the information available to regulators. The existence of regional producers constrains incentives for monopolistic behaviour, encourages new entry, promotes market contestability, increases the scope for franchising, mitigates some of the potentially negative effects of vertical integration, and impedes collusion.

The underlying technological and market conditions of drinking water supply and sewerage mean that, usually, there are no national or regional drinking water and sewerage networks because the cost of network facilities and of pumping long distances over sparsely populated areas exceed the costs of water extraction and treatment. To be successful, such competition would require sophisticated metering technology, a high degree of coordination, and strict and continuous monitoring of the quality of water that each utility supplies to the common network. Moreover, the barriers to competition are unlikely to be reduced by the kind of technological progress which opened the telecommunications and, to a lesser extent, electricity sectors to competition.

Horizontal separation does provide, however, even in drinking water supply and sewerage, the opportunity for direct competition for larger industrial and commercial customers. Although duplication of the network of water mains or sewers is almost always inefficient and implies a large loss of economies of scale, direct competition for larger customers could be feasible under certain circumstances, especially if there is some product differentiation, i.e. the competing utilities provide different qualities of water or wastewater treatment (Armstrong, Cowan and Vickers, 1994).

The existence of several geographically separate drinking water supply and sewerage utilities could allow competition between contiguous utilities for the right to supply customers at the boundaries of the utilities' service areas. The greater the number of geographically separate utilities, the greater is the scope for such competition and the greater are the losses of economies of scale for each utility as its size and that of its service area fall.

For example, in the privatized water industry in England and Wales, spatial competition currently takes two forms - new appointments for new developments within existing allocated company areas (see Box 4) and cross boundary competition where a company must respond to requests for domestic water from any customer regardless of location (OFWAT, 1995f). The customer would have to meet any costs involved in providing the necessary pipework. The possibility of extending cross boundary access to non-domestic water supplies is being considered.

Horizontal separation in the electric power generation sector would tend to encourage inter-utility competition, conclusion which is confirmed by the generally successful experiences of Argentina and Chile. In Argentina, for example, the three major federal utilities were broken into numerous concessions (Torres, 1995).

On the other hand, the exhaustion of economies of scale for generation does not in itself guarantee that a full and effective competition will emerge from horizontal separation. For example, the effects of potential entry on market behaviour may generally be small, particularly is the short- and medium-term, because of the importance of sunk costs in generating plant investments, the lumpiness of those investments, and the ability of generators to communicate price changes rapidly (Schmalensee and Golub, 1984). In the longer-term, new entry will depend on the growth of demand. Breaking-up an integrated utility can impose high costs on the sector which need to be carefully weighed against the potential benefits of cost-minimizing behaviour under competitive pressure.

If effective competition cannot be introduced through vertical separation on balance it may be better to leave the industry horizontally integrated (Bacon, 1994). The effects of horizontal separation would probably be negative in the economies at lower levels of development and small power systems because of the inability to exhaust economies of scale at the level of individual generators and the impossibility to adopt sophisticated bidding systems such as power pools. Furthermore, in the countries where such sophisticated devices cannot be made to work, horizontal separation will involve the extra cost of maintaining reserve margins against uncertainties.

For effective competition there should be a sufficient number of firms to avoid collusion and gaming in the system (Bacon, 1994). In the smaller and less developed countries, the market can be too small to support enough firms to achieve truly competitive behaviour, except at an unacceptable loss of economies of scale. A concentrated industry structure where generating capacity is concentrated in two or three firms which can influence the price at which electricity is purchased from them is likely to be seriously inefficient. Firms should be similar in size and cost structure, adequate transmission capacity should exists and transmission costs should be low.

Entry into the industry (obtaining licenses, constructing the plants, etc.) should be easy and rapid and incumbents should not enjoy important cost advantages unavailable to new entrants (Bacon, 1994).

Horizontal separation along regional lines may tend, however, to encourage companies to develop geographic market sharing. As a result, competition would be constrained through tacit collusion not to compete for each others markets (Vickers and Yarrow, 1988).

Improved access to information. Even when horizontal separation leads to local monopolies, unless there is no correlation in the cost conditions among them, it enables regulators to have access to information from a group of independent providers of comparable services, characterized by a variety of common features in the input and output markets. This provides a basis for comparisons across those firms useful for setting incentives, based on relative performance, and hence opportunities for the implementation of more effective regulatory incentive structures - based on comparative yardsticks or benchmarks - than those that are feasible when there is only one firm.

The benefits of informational advantages in creating and maintaining many similar firms are more likely to outweigh the loss of economies of scale or scope where a regulated industry is mainly an aggregate of several local monopolies (e.g. drinking water supply and sewerage) than where the natural monopoly element is itself on a national scale (Beesley and Littlechild, 1989). The higher the correlation in the firms' environments, all else being equal, the more likely it is that the benefits from the enhanced effectiveness of regulation when there are several firms outweigh the possible loss of economies of scale and scope that functional separation would involve (Armstrong, Cowan and Vickers, 1994).

Although an increased number of firms can assist regulators by providing them with greater information and improving its quality, horizontal separation also implies that regulatory agencies will be faced with the prospect of regulating and monitoring different sets of tariff structures and service quality standards with variations in cost and other conditions (Vickers and Yarrow, 1988). This may cause serious administrative problems that could potentially impair the quality of regulation, particularly if the regulatory body does not have adequate resources.

The role of the capital market. The transferability of private ownership rights in the capital market reveals information via changes in share prices, which, if the market is efficient, capitalizes the consequences of current actions for future profits (Vickers and Yarrow, 1991). The existence of regional private companies exposes the industry to competition in the capital market where water sector utilities must

complete for capital both among themselves and with other investment opportunities. By reducing the size of privatized utilities, horizontal separation facilitates acquisition and reorganization of the poorly performing utilities and facilitates the generation of comparative information with which shareholders can assess their performance (Bishop and Kay, 1989).

Although the capital market can encourage productive efficiency through competition in terms of corporate takeovers, this might conflict with the need to maintain a sufficiently large number of independent utilities to enable the regulatory agency to conduct benchmark competition (Armstrong, Cowan and Vickers, 1994). Restrictions on the concentration of shareholdings and the large size of public utilities, some of them rank among the largest private enterprises in the economy, can reduce the threat of takeovers (Bishop and Kay, 1989). In addition, since mergers increase industrial concentration and market power, there may be a loss of incentives for innovation and managerial efficiency. This implies that additional regulatory vigilance could be needed to ensure that customers are not penalized for any inefficiency.

This concern has led in England and Wales, to the DGWS to call for separate Stock Exchange listings for all regulated water companies after takeovers, mergers or where a company outside the water industry wishes to acquire a regulated water business, to ensure that sufficient transparency is maintained to allow effective regulation (Murray, 1995 and OFWAT, 1995r). One example is the Lyonnaise des Eaux/Northumbrian Water merger where OFWAT has secured agreement by Lyonnaise des Eaux to list its entire water interests in England and Wales on the Stock Exchange by the end of 2005 (OFWAT, 1995q and 1995r).

Capital markets also provide a powerful disciplinary force on poorly performing regulators. The stock market valuation of the firm changes following any action by the regulator as its decisions are reflected in the change in share prices, i.e. if the market regards the regulator's decision as less favourable to the firm than expected, its share price is marked down and its cost of capital increases and vice-versa (Beesley and Littlechild, 1989). For example, compering the stock market returns for a regulated company or industry with the returns for a comparable sample of unregulated companies provides a useful way to test whether there is a regulatory capture (Dnes, 1995). Capital market response to regulatory decisions provides a feedback to the regulator and its supervisors, i.e. political authorities and customers, about the decision it takes and constraints regulatory discretion by the expectations of shareholders and customers to whatever range they deem acceptable or can be so presented. The role of capital market is particularly important because of the problem of government or regulatory failure and because regulators may be ill informed about the consequences of particular regulatory decisions for the regulated industry.

(b) Vertical restructuring

A utility can be described as being vertically integrated if it extends its activities over more than one successive stage of the production process of transforming raw water into final goods and services (Pearce, 1986). Vertical integration eliminates contractual or market exchanges, and substitutes internal exchanges within the boundaries of the utility (Perry, 1989). Vertical separation breaks up, or unbundles, activities previously performed by an integrated vertical monopoly. Typical examples of vertical separation are the division of a state-owned power utility into separate generating, transmission and distribution companies as has been done in Argentina.

There are three broad determinants for vertical integration: technological economies, transactional economies, and market imperfections such as imperfect competition, externalities and imperfect or asymmetric information (Perry, 1989). Vertical integration adopted by unregulated firms that are subject to a reasonable degree of competitive pressure generally promote efficiency and increase welfare. The negative consequences of strong vertical links may be sufficient to overturn the general presumption in favour of vertical integration where either (Yarrow, 1991):

- vertical arrangements are not the products of competitive process, e.g. have emerged from the pre-privatization structure of a sector; or
- there is a major horizontal failure of dominance or collusion; or
- there are existing regulatory controls.

Although, even where these conditions hold, the continuation of vertical integration can usually be justified on efficiency grounds (e.g. economies of scope), in regulated industries with natural monopoly elements, vertical integration usually does possess potentially negative effects on economic efficiency.

Vertical integration can allow a natural monopoly to extend its monopoly power to the non-regulated upstream and downstream markets. It can discriminate in its own favour or in favour of affiliated firms, increasing barriers to entry and foreclosing competitors - by means of prohibitive network access charges or discrimination in other terms of interconnection such as the quality of access. Such negative effects are associated chiefly with network services. The existence of regulation in one of the market segments can greatly enhance the incentive for the firm to use its market position to extract profits from other stages of production or distribution (Yarrow, 1991).

Some potentially competitive and not naturally monopolistic water-related activities, e.g. electricity generation and water extraction and treatment, are upstream from the distribution network which typically is a natural monopoly, while others

e.g. wastewater treatment and commercial operations, are downstream. Effective competition in any of these activities will require a regulatory framework to ensure access on a fair basis to network facilities. Ownership of network facilities, by a vertically integrated firm, is not necessarily, however, a decisive obstacle to the emergence of competition. Advances in technology, changes in factor prices and in other market conditions can erode the advantages of vertical integration and create opportunities for new entry and competition.

Vertical integration tends to hamper effective conduct regulation and, in practice, it can be difficult to hold in check anti-competitive behaviour of vertically integrated firms by vertical conduct regulation without some measures of structural separation. Vertical integration usually worsens the asymmetry of information between regulator and firms and impairs the quality of the information available to the regulator. This hinders effective conduct regulation and provides opportunities for circumvention. As a result, to be effective, conduct regulation has to be more proactive and intrusive (Stewart-Smith, 1995).

The potential benefits of vertical separation have to be carefully balanced against the loss of the economies of scope and scale, the costs of sector restructuring, and the possible loss of some internalization of externalities. If these factors - in particular, economies of scope - are significant, there may be a case for the continuation of vertically integrated monopoly. If these factors are not so significant or the benefits of competition and of more effective conduct regulation are substantial, then vertical separation would be desirable. If parts of industry must remain vertically integrated, vertical conduct regulation or measures of partial vertical separation will be needed to establish conditions for effective competition.

There are various policy options for countering the negative effects of vertical integration short of breaking up the vertically integrated firm, including, laissez faire, establishing a right to interconnect with terms left to negotiations, using antitrust law to limit anti-competitive behaviour, publishing the terms of negotiated agreements, imposing terms if the parties fail to agree, and imposing public service obligations for interconnecting firms (Guasch and Spiller, 1994).

(i) Vertical restructuring in drinking water supply and sanitation

There are two separate natural monopolies in drinking water supply and sanitation - water distribution and sewerage collection (Vickers and Yarrow, 1988). Economies of scale are much less in raw water extraction and treatment and in wastewater treatment and disposal. The scope for increasing competition through

vertical structural reform is, however, extremely limited because of the strength of the natural monopoly conditions which derive from the established local networks of water mains and sewers. The obstacles are the need for extremely tight coordination between the services, due to the interrelated demand, the high costs of service delivery, in relation to the costs of water production or wastewater treatment, and the fact that the experience gained and the equipment used in one is useful for the other.

One alternative for promoting competition is the use of franchising, specifically service contracts, concessions and BOT contracts (see UN/ECLAC, 1995b). Many water utilities already use franchise-type arrangements, especially for auxiliary activities such as cleaning, food catering, security, vehicle leasing, etc. It is also common to contract out administrative, commercial, training, technical assistance and standard professional services as well the managing of non-core assets and activities. Activities, such as construction, billing and collecting, meter reading, and operation and maintenance, can also be contacted. It is more complicated to ensure effective coordination, controls and supervision when contracting water production, treatment and distribution, and wastewater treatment, but it also can be done. Economies of scale are not sufficiently large to justify high levels of national or regional concentration of sewage treatment (Vickers and Yarrow, 1988).

In Latin American and Caribbean countries, water utilities have been usually heavily vertically integrated to a degree that they include all operational and support functions, including those which do not exhibit natural monopoly characteristics. Many utilities could realize substantial cost savings and enhance efficiency through vertical separation by means of franchise arrangements with private firms. Many activities can be opened to direct competition. For example, approved contractors can compete for connection work. In Chile, services not subject to regulation, including connections, may be undertaken by contractors or the customers themselves, subject to meeting approved standards (Chile, 1988). In Mexico, wastewater treatment is contracted out on a large scale (Mexico/CNA, 1993). The Mexico City franchises are an example of what can be done in the separation of functions (see UN/ECLAC, 1995b). In England and Wales, consideration is being given to allow developers and builders to carry out connection work, subject to company inspection (Byatt, 1996), and to oblige companies to put connections out to competitive tender (Buckley, 1996).

(ii) Vertical restructuring in electricity

Natural monopoly in the electricity sector is confined to the transmission and distribution systems. There is also, however, a need for very close minute-by-minute coordination between generation and transmission, since demand fluctuates

randomly, supply is subject to unpredictable outages and equilibrium must be maintained continuously throughout the system (Armstrong, Cowan and Vickers, 1994). This provides powerful arguments in favour of a policy of vertically integrated monopoly for generation and transmission and explains why in most countries the two activities have typically been vertically integrated. Other arguments in favour of integration include optimal investment and capacity planning and operational coordination (IEA, 1994). Integration also facilitates the handing of power disruptions and supply emergencies.

The problem with the integrated model is that effective competition can be difficult to achieve because control over the transmission network would give its owner an enhanced ability to deter new entry and discriminate in favour of its own subsidiaries (see Paredes, 1995). The separation of electricity generation from transmission and distribution creates conditions for effective competition and encourages new entry. Various forms of competition between generators become possible under vertical separation ranging from contract competition to supply the transmission grid under long-term contracts, which may be tradable or not, to spot market competition (Armstrong, Cowan and Vickers, 1994).

Electricity pools simulate a competitive marketplace where generators compete for the right to supply bulk electricity in time slots (usually 30 or 60 minute periods) by specifying a supply schedule of price and quantity for the slot they wish to bid for (World Bank, 1994a). Although power pools facilitate competition and provide the prospect of the maximum gains from competition for customers, they are difficult and costly to develop and operate and these costs may outweigh the benefits while their complexity and volatility can discourage investment (Turgoose, 1995).

Spot markets in electricity can make prices volatile and unpredictable so that contracts between generators and distributors or large customers are widely used. Competitive discipline is maintained through contract competition. Although long-term contracts offer generators an adequate insurance against risks, contract specification is a complex task. Inefficiencies can arise because it is impossible to cater for every eventuality and there are difficulties with contract monitoring and enforcement. In addition, the grid operator needs to have considerable authority over generators to deal with short-run contingencies (Armstrong, Cowan and Vickers, 1994).

In the countries where the power market is small in relation to the minimum efficient scale of generation, suitable sites for new generating plants are few, transmission capacity is insufficient or the costs of sector restructuring are very high, the potential benefits from vertical separation will be restricted because any efficiency gains from increased competition would be offset by the loss of economies

of scale and scope and the additional coordination costs. The effectiveness of competition under vertical integration depends on characteristics of the bidding process, the terms of access to integrated firm's network and on the configuration and evolution of the transmission and distribution systems.

An energy system, whether vertically integrated or not, which includes independent power producers has a number of important advantages over the traditional integrated utility. In addition to diversification benefits of having a number of independent generators, independent power producers have powerful incentives to ensure reliability and operate plants at optimal standards. In addition, competition provides a powerful market-based system of contract selection as each contract typically must pass at least four highly efficient financial and technical evaluations from those of the developer, the construction-lender, the equity participant and long-term creditors (Siddique, 1995). Many countries in the region already have or plan to have electricity systems incorporating independent power producers.

(c) Structural reform and service provision in rural areas

Privatization combined with horizontal separation has given rise to the possibility of a deterioration in services provision in rural and remote areas, because market forces might tend to focus supply on strong-demand, low-cost areas, at the expense of sparsely populated and remote areas (Brun, 1991). It is argued that horizontal separation will eliminate cross-subsidies between urban and rural areas. These subsidies have been extensive within public utilities providing water-related services in urban and rural areas and have been the main mechanism for subsidizing services in rural and remote areas in many countries.

Separating service provision in urban and rural areas generally does not imply a major loss of economies of scale and scope, with the possible exception of some loss of economies of scale in administration and regulation, and of the possible benefits from some internalization of externalities. The technology widely used in rural areas means that rural drinking water supply systems are not natural monopolies or have low economies of scale. By isolating the urban service, horizontal separation could promote new entry and direct competition in rural areas. The benefits of cost-minimizing behaviour under competitive pressure can be counted on to offset, at least in part, any losses of economies of scale or scope.

Horizontal separation makes cross-subsidies between urban and rural areas more transparent, helps identify more precisely the subsidies needed to provide services in rural and remote areas, and improves accountability in service delivery.

It also facilitates conduct regulation, because service providers will have less opportunity to circumvent regulation and because it allows for better performance comparisons and more efficient regulatory monitoring through benchmark competition.

Cross-subsidies between urban and rural sector are difficult to justify, except for political reasons. There is nothing intrinsically "fair" about cross-subsidies between two groups of a population where the supply of a product such as water or electricity to one group consumes more scarce resources than supply to the other. Poorly designed cross-subsidy schemes can also affect the international competitiveness of exporters. Direct assistance to the disadvantaged population groups generally would be more efficient, than to use market-distorting cross-subsidies to achieve income redistribution objectives (Stevens and Michalski, 1993).

Rural and urban drinking water supply and sanitation require different technological, institutional and financial approaches, therefore, it may not be wise to assign responsibility for the two to a single operator (Triche, 1990). Failure to effect horizontal separation can have perverse, unintended consequences for service provision in the rural areas, such as the application of urban standards. The continuation of subsidies can stifle the emergence of alternative technologies and forms of service provision better reflecting the needs and peculiarities of the rural sector.

For a long time it has been widely assumed that because of the special characteristics of rural areas - low population density and low income level - financially viable service provision of adequate quality is impossible there without an external subsidy. These considerations have led many governments to believe that rural people have only a basic need which can be best met by limiting services by supporting only low-cost technologies. This approach has restricted choices and has proved highly counterproductive, even in many instances offering services which do not correspond to what rural people want and has led to the so-called "low-level equilibrium trap" in which customers are not willing to pay for what they find to be an unsatisfactory service (Serageldin, 1994).

A recent multi-country study by the World Bank of households' demand for improved drinking water supply services found that household income, although important, is not the overriding determinant of demand for improved services, and that there are many villages in which most households' willingness to pay for reliable private connections is high relative to the costs of supply (Briscoe *et al.*, 1993). According to the study, many more communities fall within this category than is commonly assumed. Although the study specifically refers to rural communities in

northeastern and southeastern Brazil, its authors are of the opinion that, in general, most of the large rural communities in Central and Latin America probably fall in this category. In these communities a large proportion of rural people want and are willing to pay substantial amounts for private connections, and will pay more if the service is reliable.

The possible negative consequences of horizontal separation for service delivery in rural areas could be avoided by adopting measures to facilitate private sector participation in the provision of services in the rural areas where households face difficulties in paying the full cost of improved services. External subsidies can be maintained or other forms of fiscal equalization and spatial transfer could be adopted. Rural drinking water supply programmes should be, however, demand-driven, any subsidies should not distort the community's choice, and beneficiaries should mobilize a considerable portion of the resources (see Briscoe *et al.*, 1993). Demand-side assistance, i.e. giving subsidies directly to households and not to utilities, should be encouraged because these ensure that the intended beneficiaries are properly targeted.

Where supply-side subsidies have to be used for rural drinking water supply, one option would be to award contracts either on the basis of an explicit, pre-specified subsidy, with the winning bidder quoting the lowest tariff, or on the basis of a given tariff, with the bidder quoting the lowest subsidy. Where initial connection charges are large and rural households cannot mobilize the funds needed to pay them, subsidies in the form of soft loans, recoverable over an extended period, would do more to improve households' welfare than price subsidies.

Community participation is often an essential feature of the provision of drinking water supply and sanitation services in rural areas. There is much evidence that projects with high levels of community participation are more likely to have the drinking water supply maintained in good condition (see Figure 5).

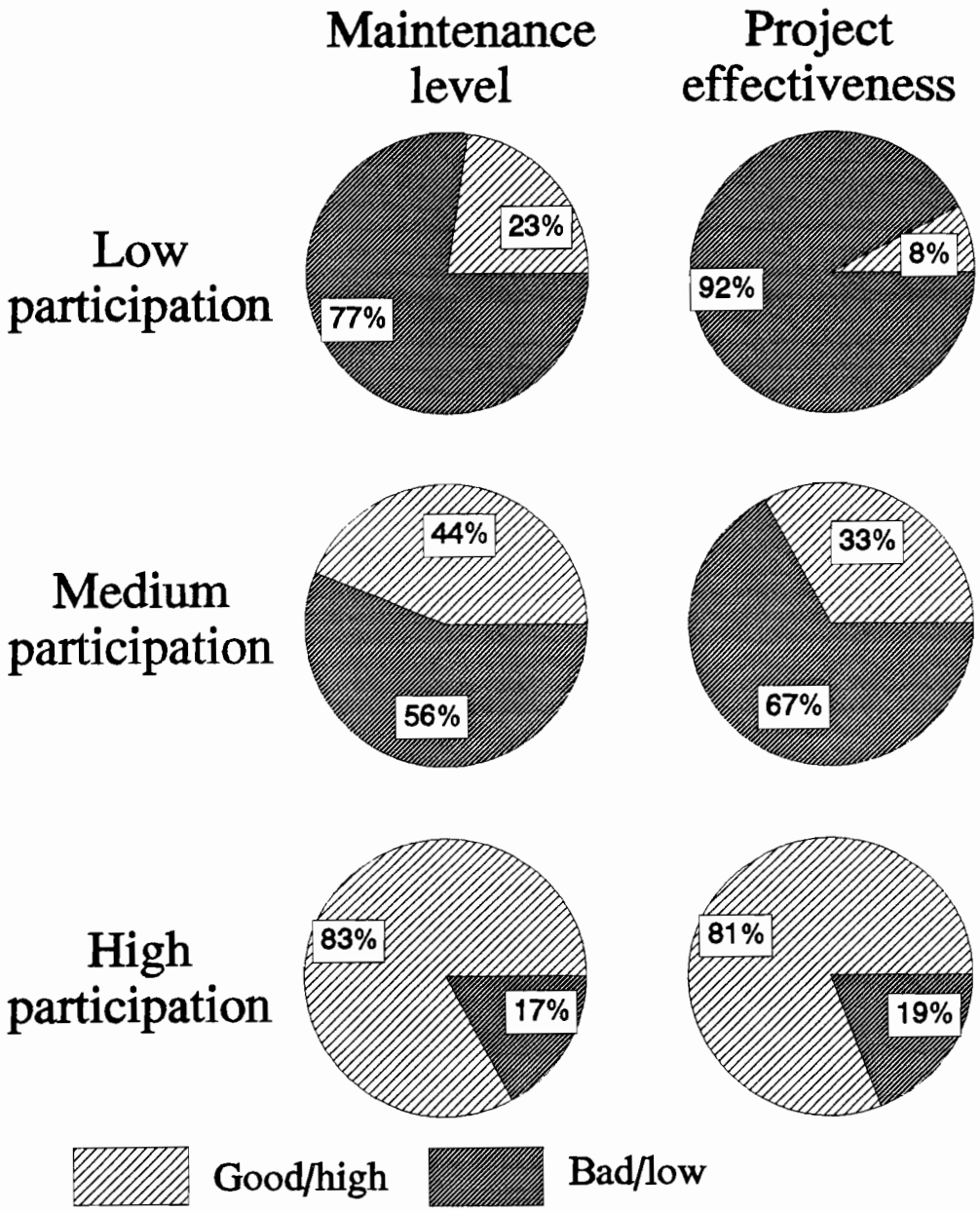
2. Diversification

Diversification is a common tendency in many regulated industries. These is an obvious incentive for any regulated company to generate earning which fall beyond the controls of regulatory authorities and the stronger regulation of the core (regulated) business, the stronger the incentives to diversify (Freeman, 1991).

Historically in the United Kingdom, and currently in North America, there are precedents for joint utility companies (OFWAT, 1995i). Many British water companies have diversified into non-regulated business ranging from environmental

Figure 5

Participation improves maintenance and increases effectiveness in rural water supply projects



Fuente: WB (1994a).

services, waste management, engineering and environmental consultancies and process engineering to computer information technology, bottling mineral water and television (Nakamoto, 1991). In France, the major water companies have diversified taking over other urban services such as sewerage and sewage treatment, solid waste, public transportation, heating networks, cable television and even funerals or absorbing or been absorbed by public works companies or engineering consultants (Barraqué, 1993).

While diversification is generally accepted to be beneficial and desirable - it allows to spread risks and compensate for fluctuations in demand, improves management and productive capacity utilization, provides an opportunity to diversify away from declining markets, permits to exploit to the full comparative advantages and could have other beneficial effects - diversification of regulated firms (or a merger between two regulated firms, particularly in an overlapping geographic area) might represent a concern for regulators for several reasons (Armstrong, Cowan and Vickers, 1994):

- a failure of the non-core (unregulated) business could negatively affect the ability of the utility to raise capital for and operate the core business;
- diversification makes estimation of the cost of capital more difficult and if the firm diversifies into a risker business, diversification might increase the cost of capital; and
- the operation of non-core business might consume excessive amounts of management time and resources.

Diversification of a regulated firm or mergers between regulated firms can worsen the asymmetry of information between regulator and firm and reduce the regulator's ability to implement benchmark competition either by reducing the number of available comparators or by affecting the comparability of the firm with others.

Diversification also allows scope for cross-subsidization through transfer pricing in intra-company transactions, which could result where the regulated business pays higher prices than the market rate for the goods and services provided by associated companies. Transfer pricing can be used to circumvent economic regulation and to support anti-competitive behaviour of affiliated companies. To cope with this problem, a regulator could impose an obligation to use competitive tendering or other appropriate methods of market testing to ensure that the work contracted out to affiliated companies is being done at competitive rates. To prevent cross-subsidization, it is also important to ensure that there is an appropriate allocation of costs between the regulated and non-regulated business. However, rules for cost allocation are difficult to determine given the asymmetry of information (Armstrong, Cowan and Vickers, 1994).

For these reasons, regulatory policy should be prepared to impose some constraints on the diversification of regulated firms into unregulated activities (Rees and Vickers, 1995). On the other hand, it would be imprudent to impose a blanket prohibition on the diversification of regulated firms because there may be economies of scale and scope, so cost reductions can be realized when a single supplier is able to offer both regulated and unregulated services (Braeutigam and Panzar, 1989). An important question for policy is how to structure the regulatory system to take advantage of economies of scale and scope while avoiding the undesirable effects of diversification into unregulated markets.

To deal with the issue of diversification, regulators can adopt a number of measures including requiring utilities to maintain separate accounts and issue separate financial statements for the regulated part of the business or to separate the regulated part of a company from the unregulated activities and impose an arm's length relationship between the two parts of the business (IEA, 1994). These measures can be strengthened by close supervision of dividends, loans, asset transfers and other financial transactions between regulated business and the group and by prohibiting the regulated business to lend, extend guarantees, pay dividend or transfer assets to the other companies in the group without the regulator's consent.

In England and Wales, OFWAT has obliged the directors of drinking water supply and sewerage companies to ensure that there are sufficient financial and managerial resources to run the core business, and that they certify that this remains so after a diversification (Armstrong, Cowan and Vickers, 1994). In addition, water companies are under a legal requirement to conduct their business at arm's length from other companies within their group structures and ensure that there is no cross-subsidization between the regulated business and non-regulated activities or any associated company (Byatt, 1995e). OFWAT has also strengthened its controls over inter-company transactions through both formal licence amendments and the issuing of guidelines and reporting requirements for the companies.

The form of price regulation has important implication for the incentives of the regulated firm to diversify. Rate-of-return regulation might give the firm an incentive to expand into other regulated markers, even if it operates at a loss there (Averch and Johnson, 1962). This behaviour may discourage new entry and drive out other - even lower-cost - producers from these other markets. This incentive might arise where expanding into other markets enables the firm to increase its rate base and hence permits it to earn a greater total profit than would have been possible without diversification.

In competitive markets, rate-of-return regulation can give a firm incentives to misreport its cost allocation reporting any expense as attributable to the regulated service or, failing that, as a common cost; charge prices below marginal cost in a competitive market included in the set of core markets subject to an aggregate rate-of-return constraint; and view diversification decisions inefficiently (Braeutigam and Panzar, 1989). Diversification might also affect the firm's incentives governing the choice of output level and technology, as well as its incentives to undertake cost-reducing innovations in the regulated and competitive markets.

Price-cap regulation replicates the competitive process more accurately than rate-of-return regulation and, at least in principle, induces the firm to diversify into a competitive market if and only if diversification is efficient (Braeutigam and Panzar, 1989). Since pure price-cap regulation does not require allocation of costs, incentives to misreport cost allocations and choose an inefficient technology would disappear or greatly diminish. In practice, however, given the asymmetry of information and the fact that price-cap regulation usually incorporates some of the features of rate-of-return regulation, the same problems are still of concern (Armstrong, Cowan and Vickers, 1994).

3. The timing of industry restructuring

Any restructuring of an industry, with characteristics of a natural monopoly or other market failure, is much more easily done while it is still state-owned. Where an industry with characteristics of a natural monopoly is transferred to the private sector, its most valuable asset may not be the physical infrastructure, but rather the license or right to provide the monopoly service under specified conditions (Guislain, 1992).

The form of regulation has a direct impact on valuation, as more stringent regulation or lower protection from competition means lower profits, hence lower price. This implies that in order to be able to make a rational decision on whether to bid and what technical and financial offer to make if they do bid, investors need to know under what regulatory regime the utility will be operating. Uncertainty with regard to the applicable regulatory regime and future restructuring would result in lower investor interest and sale price, might attract those entrepreneurs who have greater lobbying power or with greater willingness to take risks, and is likely to reduce incentives to invest. In addition, subsequent restructuring might constitute a breach of faith with investors, and uncertainty about future reforms might seriously undermine investment planning and increase the cost of capital (Vickers, 1991).

Any entrepreneur has a very strong interest in preserving, creating, and generally trying to reassemble monopolies (Newbery, 1994). On the other hand, by shifting emphasis in corporate objectives towards profit maximization, privatization might increase dangers of anti-competitive behaviour (Vickers, 1991). These considerations imply that the success of privatization can depend on resolving such issues as functional separation and establishing a transparent and credible regulatory framework prior to sale, with a view not only on managerial efficiency, but more importantly on preventing the consolidation of private monopolies in competitive markets (Bitran and Sáez, 1994). If these issues are postponed, uncertainties about their resolution will make it difficult to promote competition once market structures are consolidated and property rights allocated.

II. Government or regulatory failure

In the case of market failures, economic theory prescribes that the proper role for the government is to intervene in a manner that will correct them and restore or substitute the requisite conditions to restore economic efficiency (Ward and Deren, 1991). Unfortunately, government interventions are often non-optimal, in the sense that they either fail to correct for market failures and restore efficiency or introduce additional distortions. In addition, markets often find ways to mitigate their own failures, in other cases, an apparent market failure does not reduce welfare in any appreciable way.

Public interest theory holds that regulation is undertaken to protect the public from the abuses of market imperfections (Phillips, 1993) and views the government and the public sector as omniscient and benevolent maximizers of social welfare, i.e. which attempt to maximize some kind of social welfare function. The theory emphasizes government's role in correcting for market failures (Laffont and Tirole, 1991).

Given the different forms of government intervention that have occurred in recent decades, in general, and the state of water-related services under public sector provision in particular, it does not seem appropriate to assume that governments are sufficiently efficient, fair and wise to be capable of adopting the optimal intervention prescribed by public interest theory. Moreover, it can be easily observed that the results "of economic regulation often differ considerably from the predictions of 'public interest' models" (Joskow and Rose, 1989), and, obviously regulation has a political, as well as, an economic dimensions (Baron, 1988). It is now recognized that "regulation and regulatory process respond to complex interactions among interests groups that stand to benefit or lose from various types of government intervention" (Joskow and Rose, 1989).

The idea of government or regulatory failure challenges the assumption that government is a disinterested champion of the public interest. It pretends to explain the pattern of government intervention in the economy in general and water-related activities in particular emphasizing the role that rent-seeking behaviour, interest groups and capture play in the formulation and conduct of government policies with

respect to economic matters. Under these arguments the public sector is seen as either unwilling or unable to serve the public interest. Unwilling, because it might seek objectives of its own, separate from the priorities of citizens, and unable, because it operates in an environment full of information asymmetries and under budgetary constraint.

The public choice theory views bureaucrats as seeking power and resources by increasing the scope and scale of government intervention beyond the extent justified by the interests of welfare maximization (Holtram and Kay, 1994). Political business-cycle theory, on the other hand, assumes that political parties are economic institutions which seek the support of electorates badly informed about the motives of politicians and on the economy at large. The capture or interest group theory draws attention to the role of interest groups in the formulation of public policy (Laffont and Tirole, 1991).

The possibility of government or regulatory failure means that the identification of market failures is only a necessary, but not a sufficient condition, for government intervention in water resource management or any other area. To be sufficient, the potential costs of government failure associated with intervention must be less than the expected costs of market failure, i.e. governments must be able to do better than markets (Helm, 1993 and 1994b). If this second condition is not met, government intervention will impair rather than restore economic efficiency.

A. Rent-seeking and regulatory capture

It is useful to distinguish between two broad forms of government or regulatory failure of relevance to the discussion of the regulation of private sector participation in the provision of public services. Rent-seeking is the pursuit of self-interest by politicians, regulators, public sector employees, and other groups while regulatory failure or capture occurs when the regulatory authority falls under the undue influence of some special interest group (Helm, 1993 and Stewart-Smith, 1995).

1. Rent-seeking

There are two diametrically opposite views on how to explain the apparent deficiencies in public sector management of public services. The traditional view identifies the public sector with the pursuit of the public good and attributes the generally poor financial and production record of most state-owned enterprises and their failure to provide decent quality service to a variety of financial, administrative and managerial problems.

An alternative view, in line with the public choice theory, attributes deficiencies in the public sector to the existence of the private objectives of politicians and bureaucrats that divert public sector companies from their stated objectives (Wirl, 1992). The traditional approach does not or only rarely acknowledges that politicians and bureaucrats may be pursuing other objectives than the maximization of social welfare through the delivery of water-related services, and that these informal objectives, or rent-seeking, can possibly have important and pervasive implications for how water systems are actually designed, built, operated and maintained (Lovei and Whittington, 1991).

Rent-seeking and other similar activities relate to a subset of the broader class which are referred to collectively as "directly unproductive, profit-seeking activities" (Bhagwati, 1982 and 1987). A salient feature of these is that they are directly unproductive; i.e. they are privately profitable but their output is zero. Directly unproductive, profit-seeking activities are wasteful in their primary impact - they consume real resources to produce private profits but zero output - therefore they usually result in the immiserizing of total output.

In the water-related sector, the rent seekers are various. The first, and main group, consists of the politicians. Political parties have high costs of operation, high costs of maintaining their organization and competing in elections. They maintain this organization and their electoral appeal by the performance of services to potential voters at all times, not just before elections (Stigler, 1971). One part of the costs of services and organization are borne by putting a part of the party's sympathizers on the public payroll. By doing so, politicians impose a small marginal cost on the individual taxpayer to repay the elected official's supporters (Lambert, Dichev and Raffiee, 1993). This would result in an inefficient use of labour in publically-owned water-related utilities.

Another part of the costs of political parties' organization and operation can be recovered through the sale of regulation (Stigler, 1971). Since the objective of any regulated industry is to maximize profits and therefore to be confronted with the weakest regulatory constraints, there is an incentives to acquire regulation. When an industry acquires regulation, however, it can be expected that the benefit to the industry usually is less than the damage to the rest of the community (Stigler, 1971). Empirical studies of public utility industries suggest that although price regulation generally constraints prices below the level an unconstrained monopolist with a legal exclusive franchise would choose, they may not be lower than those which would be under a fundamentally different industry structure (Joskow and Rose, 1989).

A second group of interests is made up of bureaucrats, including those concerned with the regulation of private firms. Rent-seeking by regulators includes

the pursuit of self-interest so as to increase their areas of power and responsibility, to maximize the resources at their disposal, and to cost inflate, an activity to which they might be even more prone than politicians.

Given that regulators usually: (i) do not have a clearly defined set of objectives against which to measure their performance because of conflict among policy objectives and because an operational definition of welfare is lacking; (ii) have considerable scope for discretion; and (iii) regulatory offenses are usually poorly defined, there are grounds to believe that they may have ample scope to maximize their own interests and pursue private goals (on the basis of Helm, 1993 and 1994b). Moreover, it is usually hard to create incentives for effectiveness in regulatory agencies, and the failure of a regulatory agency to function effectively can undermine the potential benefits of competition and private sector participation (Triche, 1990).

The incentives to rent-seeking by regulators include both direct and indirect rewards (Helm, 1994b):

- The direct rewards are the maximization of lifetime income. Although they are usually low in the short run, they may be high in the long run.
- The indirect or non-pecuniary rewards include the consideration, on the one hand, that most regulators find their jobs interesting and intellectually satisfying, while on the other, some may have their own economic theories which they are likely to be tempted to apply to the industry they regulate

Vulnerability to capture and opportunity for rent-seeking increase where the regulatory regime provides high levels of discretion to regulators and entrusts them with open-ended powers while leaving their objectives ill-specified and duties vaguely defined (Helm, 1993). This may include setting duties independently of cost considerations, not establishing a clearly defined set of objectives and priorities against which to measure regulatory efficiency, defining regulatory responsibilities in an unduly complex or vague way, or adopting a piecemeal case-by-case methodology which makes every intervention a special case, with regulators given wide powers to adjudicate. It follows that, in designing regulatory regimes, there is a premium on clarity of objectives for regulators to limit discretion and the pursuit of their own or interested parties' informal agendas, on relying on general rules, on setting constraints to the scope of regulation, on limiting the total resources available to bureaucracies, and on simplicity where outcomes are closely defined through rules (Helm, 1993). It may also be useful to create opportunities for participation in the regulatory process by all interested parties (Levy and Spiller, 1994).

Other groups of rent-seekers can be readily identified. For example, workers employed in the water sector can be expected to capture a share from the possible monopoly rent either in the form of wages and other benefits, such as security of employment, or by not having to work too hard (Wirl, 1992). A further group are influential consumers who can use their influence with politicians to achieve favourable tariffs (this helps explain, at least in part, the prevalence of uniform tariffs and cross-subsidization for drinking water supply and sanitation) or to influence the composition of the investment programme. Empirical studies suggest that in public utility industries, the structure of prices across classes of customers often reflect distributional and political objectives, rather than efficiency considerations (Joskow and Rose, 1989).

Another rent-seeking group is formed by special-interest lobbies which demand financially unviable services which will either tap general public sector revenues or receive a cross-subsidy from potentially profitable services. The major costs of rent-seeking in the latter case arise because of the need to use inefficient methods to transfer funds to the potential beneficiary, because efficient methods would be too open to public scrutiny (Tullock, 1987b).

2. Regulatory capture

Regulatory failure or capture occurs when the regulator falls under the undue influence of either government, the regulated firm, its competitor or rival, consumers, or some other interest group (Stewart-Smith, 1995 and Helm, 1994b). It occurs because government decision-making affects both the industries' and the consumers' welfare (Laffont and Tirole, 1991). "When government intervention, rather than actual market performance, determines which firms are winners and which are losers, corporate executives have an incentive to devote resources to lawyers and consultants rather than to scientists and engineers. ... The hearing room rather than the industrial laboratory becomes the focus of attention" (Berg and Foreman, 1995). However, since interest groups try to capture the regulatory process in order to redistribute wealth, policies that reduce the total wealth available for redistribution - and hence the political pay-off from regulation - will tend to be avoided and those that increase wealth - preferred (Peltzman, 1989).

It is useful to distinguish two broad forms of regulatory capture: top-level regulatory capture, which occurs in the legislature as regulatory policy is formulated and legislation passed, and lower-level regulatory capture which occurs in the regulatory agency and the ministerial decision-making, as regulatory decisions are made once the regulatory framework is in place (Dnes, 1995).

Members of interest groups (frequently, but not always regulated firms) are better organized and have stronger incentives, than broad, amorphous and dispersed groups of consumers with a low individual stake, to exercise political pressure on regulators and legislators in order to affect regulatory outcomes. As a result, these compact, well-organized groups will tend to benefit more from regulation than broad, diffuse groups (Peltzman, 1989). As interest groups must compete with each other for influence, regulation will tend to preserve a politically optimal distribution of rents across this coalition of consumer and producer groups. On this view, regulation emerges when there is a large divergence between the political balance of pressures and the unregulated distribution of wealth. As a result, much regulation "may be the product of coalitions between the regulated industry and customer groups, the former obtaining some monopoly profits from regulation, the latter obtaining lower prices (or better service) than they would in an unregulated market - all at the expense of unorganized, mostly consumer, groups" (Posner, 1974).

One obvious response to the possibility of capture is to reduce any interest groups stake in regulation (Laffont and Tirole, 1991). However, if interest groups also make a positive contribution to the regulatory process, e.g. bring new information about the firm's activity, it may be socially desirable to increase their stakes so as to induce them to acquire information (Laffont and Tirole, 1990a).

The major reasons for regulatory capture are informational asymmetries between the regulated firm and its regulators, between regulators and political authorities and between political authorities and voters. The basic informational asymmetry between firms and regulators gives rise to imperfect incentives, allows regulatees to extract informational rents from the monopoly of information that they enjoy, and therefore impairs economic efficiency.

Regulators have to make their decisions on the basis of the information available to them and the main source of this information is the regulated firm which control over the information it provides and understands that the regulatory constraints depend on this information (Helm, 1994b). Assuming that the regulated firm wants to intertemporally maximize its profits and hence seeks to be confronted with the weakest regulatory constraints, there is a strong incentive to try to bias the regulatory outcome in its favour through strategic manipulation of information. For example a far-sighted firm is likely to decide either not to maximize its cost reduction effort or to switch between high and low effort levels, because increases in the effort level today will lead to more stringent regulatory constraints in the future.

A collateral is that the incentive to exercise pressure in order to affect the regulatory outcomes would be weaker under low-powered incentive schemes than

under high-powered incentive schemes because the latter leave high potential rents to the regulated industry and thus create high pay-offs to collusion and capture (Laffont and Tirole, 1991). This inference would be true for incentive schemes where the regulatory agency plays an active role in regulation. If the regulatory agency has little discretion, i.e. performs the role of an accounting office, then stakes in collusion may be reduced by the use of high-powered incentive schemes (Laffont and Tirole, 1991 and 1990b).

There is always asymmetry of information between regulators and their supervisors (political authorities), and between the latter and voters (consumers). All bureaucracies are characterized by the attenuation of control. Lower-ranking officials keep and control virtually all of the information needed to assess their performance. Much of what they do is, therefore, unknown to those of higher rank (Tullock, 1987a). The higher the official, the less is known of what occurs at the lower level, as a result, high-ranking authorities usually receive only an "official" view of activities. They have neither the information nor expertise and resources to evaluate these reports against vaguely defined or unstated objects. Voters are never well informed about their votes because the effect of the vote on their well-being is small (Tullock, 1987a). The information at a voter's disposal tends to be biased in the direction of his or her own special interests. Only, in the absence of such informational asymmetries, would voters and political authorities be able to effectively control their agents, who thus could not implement policies favouring special interest groups at the expense of society as a whole (Laffont and Tirole, 1991).

Regulatory capture does not commonly include monetary payments. The more common forms include the fact that the regulated industry is an important source of future employment opportunities for the regulatory agencies' staff, personal relationships provide incentives for government officials to treat their partners from the regulated firms generously, the regulated industry may cater to the regulatory agency's bureaucratic desire for a quiet life or for larger resources, by refraining from publicly criticizing agency management, and it can make indirect transfers, such as monetary contributions to political campaigns, as well as the votes and lobbying of employees, shareholders, suppliers or the members of communities where regulated industries are located (Laffont and Tirole, 1991).

Generally, an industry will have better access to technical talent than the regulatory agency. This coupled with the tendency for the better trained technical staff from the public sector to emigrate to the regulated firms, due to fewer opportunities and often lower wages, creates a serious lack of qualified manpower for the regulator. The specialized nature of the duties exercised by regulators and of the skills they develop in the performance of their duties make them attractive

employees for the regulated industry (Helm, 1993). Their obvious career path is to move to the regulated private sector where they can claim lucrative appointments. The nature of their business and social contacts reinforces this tendency. This phenomenon creates conflict of interest and distorts their incentives while working for the regulatory agency; it also undermines the independence of the regulating authorities and has a general debilitating effect on the effectiveness of regulation. Traditionally, public sector wages have been low in Latin American and Caribbean countries in comparison with those of the private sector. This had led in some countries to the removal of the regulators staff from the restraints of public sector salary scales.

Every regulatory agency is required to be closely involved with the regulated companies on a day-to-day basis, with a result to identify itself or the interests of the public with the aims of the industry (McGowan and Seabright, 1995 and Booker, 1994). Such collusion between the regulator and the industry can frustrate the objective of controlling and diminishing marker failures. The regulator can become instead an advocate of the industry or even an instrument for the maintenance and reinforcement of monopoly power (Rees and Vickers, 1995). On this view, then, regulatory capture is revealed by weakness of regulatory policy towards effective competition, promotion of new entry, contestability and price and quality regulation. It leads to higher prices, lower quality and the protection of incumbents from competitive entry. Regulatory capture can also be revealed on the stock market: abnormally high returns associated with changes in the regulatory environment could indicate capture by the regulated industry, while abnormally low returns could indicate capture by consumer interests (Dnes, 1995).

To avoid these problems, regulatory personnel need not only be technically qualified, but also to be well paid relative to the regulated industry, and, if possible, prohibited from working in the regulated industry for a specified period after their appointments are terminated (Devlin, 1993). However, post-employment restrictions may be costly (Breyer and Steward, 1979), and even impossible. Other possible useful measures are panels of several regulators and the fullest degree of transparency including imposing the obligation on regulators to list their every encounter with the industries that they regulate, information that should be published regularly (The Times, 1995).

Given that in most Latin America and Caribbean countries there has been a long history of state interference in the provision of water-related services, the possibilities for establishing non-political regulatory systems seems to be fraught with many obstacles. For example, in many countries, the tariffs of water-based services have traditionally been unrealistically low and politically controlled. If they were to rise to reflect real economic costs, there is likely to be, at least, some political

pressures to minimize any increases. In Chile, for example, the introduction of the new tariff system to make the companies self-financing has demanded a considerable increase in water and sewerage rates. To allow for a gradual readjustment of consumption patters and customers' expectations, its introduction was phased in during a transition period of up to four years (Chile/SSS, 1994). In part, privatization can aid in resolving this problem because it increases the transaction costs of government interference in the workings of the firms. The efficiencies of privatization stem fundamentally from the insulation it provides from inefficient political and self-serving influences (Willig, 1993).

In an ideal world, to be effective and to avoid the problem of regulatory capture, regulatory agencies would have the following characteristics:

- they would be staffed with people of unblemished reputation and with adequate technical skills capable of fulfilling their functions at the level of expertise and efficiency required to confront the private operator on, at least, an equal basis;
- they would enjoy consistent political support and, while subject to periodic evaluation, receive a minimum of day-to-day political interference;
- they would have adequate financial, human and informational resources and an independent budget;
- they would have generic responsibilities for environmental protection or price regulation, rather than responsibilities for the regulation of particular industries (this will make possible to realize administrative economies of scale in regulation and to avoid inconsistencies in regulatory decision-making) and, to minimize the risk of regulatory capture, only possess limited discretion in the discharge of their duties;
- they would open the regulatory process to public scrutiny and would explain and justify at least some decisions and publish the evidence on which they are based; and
- they would be invested with sufficient autonomy to limit the possibility of being captured by particular interest groups, including those within government.

It cannot be expected that regulatory systems in Latin America and the Caribbean or anywhere else will exhibit all these characteristics. It is, however, of fundamental importance in establishing a regulatory system to limit the scope for regulatory capture. This is so not only to prevent its negative consequences, but also to remove the incentive for the regulated industry and other interest groups to engage - and waste resources - in rent-seeking activities (Armstrong, Cowan and Vickers, 1994). To accomplish the objective of an effective and efficient regulatory process, a regulator has to be vested with the power to "get the job done" (IEA, 1994). It is

particularly important for the regulator to have sufficient powers to compel the regulated firm to provide all information necessary for effective regulation and to comply with the regulatory framework.

There are strong arguments to move in the direction of further independence by constituting regulatory commissions that are not subordinated to the administration in power (Bitran and Sáez, 1994). A body with a high degree of autonomy and not dependent on any ministry for personnel and funding should be able to resist political interference more effectively (Mallon, 1994). Where regulatory entities have a strong dependence on ministries with political and technical responsibilities, they are not independent of the political system.

As there are incentives for the regulator to act in the interests of incumbents in the industry rather than those of consumers or potential rivals, there are grounds to argue that it could be desirable to introduce countervailing incentives for regulators to act in the interests of society as a whole. Any reward, however, will probably have to be limited to official recognition, promotion, status and other similar incentives which are used to reward the performance of public servants in general. Other incentives - such as regulatory competition or linking pay to some aspects of the regulatees' performance, etc. - are difficult to implement and are likely to have perverse consequences for the regulated industry and consumers (see Armstrong, Cowan and Vickers, 1994 and Helm, 1994b). On the whole, "it is difficult to see an alternative superior to allowing a disinterested regulator to make a decision - provided that all reasonable precautions have been taken to ensure that the regulator is indeed disinterested" (Holtram and Kay, 1994).

B. The cost of regulation

Regulation imposes direct and indirect costs on the regulated firms as well as on the rest of the economy both in the terms of money and in terms of resource misallocation. Recent studies suggest that the costs of regulation can be economically significant. For example, in the United States, it has been estimated that the cost during 1991 of all the regulatory mandates in place for all industries was some US$ 542 billion (Abelson, 1993). It is also suggested that the United States has gained at least US$ 36-46 billion (1990 prices) annually from deregulation of various industries, about a 7 to 9 per cent improvement in the part of GNP affected by regulatory reforms (Winston, 1993). The lesson to be drawn from these examples should be to minimize regulation, not because it is bad, but because "regulatory technology is characterized by diminishing marginal benefits and increasing marginal costs" and that "appropriate regulation means maximizing the benefits from removing market failures in relation to the costs of government intervention" (Jones, 1994).

The direct costs of regulation include the opportunity cost of the public and private resources devoted to operating the regulatory process and to complying with the regulatory framework (Rees and Vickers, 1995 and Jones, 1994). These direct costs depend on the degree of regulatory supervision and the complexity of the regulatory agency's task, so that more rapid changes in the underlying technological and market conditions, greater importance of joint costs, and greater variety and complexity of goods and services, among other factors, should act to increase these costs (Schmalensee, 1974).

The direct cost of administering the regulatory process includes the budget of the regulatory agency and the costs born by the regulated industry. The former is usually the smaller of the two. For example, in Chile, in 1993, the budget of the Superintendency of Sanitation Services (Superintendencia de Servicios Sanitarios) was equivalent to approximately 0.6 per cent of the billing of the drinking water supply and sewerage companies (Chile/SSS, 1994). Under the proposed modifications to the water sector legislation which provide for the privatization of drinking water supply and sewerage companies, the Superintendency would be financed by charges imposed on service providers which would not be able to exceed 2 per cent of billings (Libertad y Desarrollo, 1995).

The regulated industry rather than regulators tend to bear the main costs of regulatory administration (Helm, 1994b). For example, many regulated firms invest in large planning units whose responsibility is to monitor the conduct of regulators, to attempt to predict future regulatory decisions and changes in regulatory policy, to prepare documentation for regulatory reviews and to support the companies's claims at the time of regulatory reviews, etc. For example, the administrative costs of the regulatory supervision of water companies, in the state of New Jersey, averaged 0.87 per cent of total revenue for large companies, 5.25 per cent of revenue for small companies, and 0.92 per cent of revenue overall (Crew and Kleindorfer, 1985).

In addition to the direct costs of regulation, there are several indirect costs. These costs can arise where regulation encourages regulated "firms to (i) use transfer pricing ... to take revenue out of and load costs into the regulated business from unregulated businesses; (ii) to expand ... into unregulated activities; (iii) to use the regulated business as a method of subsidizing the funding of unregulated activities; and (iv) to transfer costs to those regulated businesses that enjoy a more liberal arrangement for passing on costs to consumers" (Bishop, Kay and Mayer, 1995). There are also considerable indirect costs incurred in rent-seeking and other behaviour to attempt to outmanoeuvre the strategy of the regulator and to influence regulatory outcomes in their favour. To this one should add the possibility that imperfect regulatory institutions operating with imperfect information and under

budget constraint may be unable or unwilling to force prices to their correct levels introducing new distortions in the economy (Schmalensee, 1974 and Jones, 1994). The most insidious of these costs perhaps are regulation's adverse effects on radical process and product innovation and the tendency to increase production costs and to shield the regulated industry from competition (Schmalensee, 1974 and 1995). These costs of regulation are very difficult to quantify.

The administrative capacities of Latin American and Caribbean governments are already strained by the weight of existing activities. Regulation is not costless and efficient regulation is a complex and expensive task. The managerial and financial resources needed to carry out the regulation process, are scarce, particularly in the public sector. Given these considerations, a too elaborate and complex regulation not supported by adequate regulatory capacity and commitment and operating under budgetary constraints might well produce efficiency losses greater than those it is intended to avoid. It is not obvious that in a country without a strong and independent public administration and with little or no useful experience with regulation of private monopolies, the regulated private enterprise form of organization will perform much better that the public enterprise form, from the perspective of the public interest.

This should not mean that some form of regulation should not be contemplated. It does mean, however, that in considering the establishment of regulatory systems governments should be open-minded in judging the various alternatives that are available and be cautious in developing too elaborate regulatory systems in environments without traditions of regulation. It also underlines the need to target regulation on the areas where market failures are most pronounced, to pay attention to the costs and benefits of regulation, and to design regulatory mechanisms to maximize the benefits in relation to the costs. Neither privatization or regulation regimes can, of themselves, resolve governments from the responsibilities to provide their population with reasonable and equable access to basic water-related services. This responsibility has to remain with government and in the area of public policy.

Regulating public utilities in Latin America and the Caribbean

The provision of water-related services has been marked in Latin America and the Caribbean by massive government failure. Government failure has not been universal in the region, in some countries and some services, there are examples of successful public sector operation, particularly in electricity generation, but also, in drinking water supply and sanitation. It is, however, by far the more common occurrence of serious and pervasive government failure that is the fundamental reason for the current widespread phenomena of the privatization of many aspects of the provision of water-related services.

In general, there are moves in all countries to increase private sector participation in the water sector. In irrigation such a tendency is all but universal, as former public irrigation districts are transferred to farmer management. This privatization process usually does not require regulation as irrigation farming is subject to market competition. In electricity generation there have been significant privatization exercises in Argentina, Bolivia, Chile and Peru with different regulatory approaches resulting in variations in industry structure. In addition, many countries in the region already have or plan to incorporate independent power producers in their electricity systems. The involvement of the private sector in drinking water supply and sanitation is more incipient, although there has been considerable franchising of systems in both Argentina and Mexico. Elsewhere, as in Chile and Venezuela, decentralization within the public sector has been the policy adopted with private sector participation limited to contractual arrangements.

In regulatory policy, nevertheless, there are two clear priorities for Latin American and Caribbean countries, the development of an effective regulatory capacity and the establishment of the independence of regulatory authorities, which should be free of direct political interference. At the same time, it is necessary for those defining regulatory policy to be absolutely clear as to what its real objectives must be. The objective of regulation is to ensure that in activities subject to natural monopolies there is the introduction of the maximum competitive pressure. Where competition is not feasible, regulator must act as a substitute for the market, taking on some of the functions of competitors, attempting to provide similar incentives to

improve efficiency by regulating aspects of the firm's conduct. It is not the objective of regulation to manage the companies which own or operate under franchising arrangements water-related public utilities. It is for this reason that the functions of the regulator must be clearly defined and strictly limited to the absolutely necessary. In general, that is why, price regulation is the preferred basic approach to be recommended, leaving other decisions to the utility managers.

In defining the type of price regulation, notwithstanding the criticisms that have been made of its incentive properties, rate-of-return regulation does have some basic advantages which make it possibly attractive for application in Latin American and Caribbean countries. It can provide to potential investors a solid guarantee of a fair rate of return, it offers a type of long-run commitment which is crucial for investments with a high sunk cost component, as in hydroelectricity generation and drinking water supply and sewerage. It provides weaker incentives for cost reduction, but performs well under uncertainty, important in economies with histories of high inflation and general macroeconomic instability, and should have a downward impact on the cost of capital. At the same time, it reduces the ability of the regulated firm to profit from regulatory ignorance or favourable cost shocks, important in countries with little regulatory experience.

There are, however, strong reasons for preferring price-cap regulation, particularly, immediately following privatization. Productivity gains, which price-cap regulation encourages, are potentially largest at the moment. Gains are also potentially larger in cases where changes in the technology applied and in market conditions will be faster. Examples include the characteristics of the industry itself, as in electricity generation, as well as the prior existence of underinvestment and poor management creating a technological gap. It is also attractive in settings in which the role of competition is increasing. These considerations notwithstanding, it seems likely that the overall incentive effects of price-cap and rate-of-return approaches do not differ much because price-cap regulation, at least as typically implemented in practice, has some features of rate-of-return regulation and vice-versa.

Under the right conditions, commercial code regulation may be a useful complement to or substitute for other forms of regulation, particularly in smaller countries and in those industries where effective competition is feasible. This form of regulation is simple to implement, is very inexpensive, and provides a means to institute regulation gradually, all factors particularly important in countries with little experience in formal regulation. It would also be useful to strengthen the use of the commercial code or anti-monopoly legislation by encouraging consumer participation in the oversight process and by encouraging the organization of small groups of customers into larger, more effective bargaining units.

Adequate information is of paramount importance for effective regulation. The regulated company's management always knows far more than the regulatory agency about both industry costs and demand conditions. Asymmetric information allows a firm to extract rents from its monopoly of information resulting in an overall welfare loss. The existence of the informational asymmetry suggests that: (i) the regulatory goal should be to design incentive mechanisms for the regulated firm that will induce it to maximize society's objectives while pursuing its own self-interest; and (ii) the prospects of generating information for regulatory purposes should be an important consideration in a government's decision about the nature of the regulatory regime and the structure of the industry.

The most promising path for the countries of the region to formally address the problem of asymmetric information in the privatized water-related utilities seems to be some form of benchmark competition. The advantages of benchmark competition are part of the case for having a horizontally separated rather than national structure in water-related public utilities.

Given that competition is at present limited in the core transportation and distribution services of the water sector, that markets for its services are characterized by informational asymmetries between service providers and their customers, and that service providers usually operate under regimes of monopoly, it is extremely unlikely that price control alone would be capable of giving sufficient incentives to profit-maximizing firms to make socially optimum quality choices. Unfortunately, the regulation of service and product quality is one of the most neglected problems in the debate on private sector participation in the water sector. There is, therefore, a strong case for supplementing price regulation with the regulation of service quality. The most promising approach to this problem would seem to be customer compensation schemes, guaranteed standards of performance and minimum quality of service standards. Formal incorporation of quality of service measures in price regulation is another interesting approach but can be difficult to implement in practice, as is usually the case.

Where a public utility faces separate regulators for quality of service, pollution and other environmental aspects, and prices, whose preferences for the various possible actions typically conflict what is generally referred to as the common agency problem can arise. This can create tension between regulators and the danger of inefficient outcomes as well as of inconsistency and a lack of credibility. These considerations underline the need for closer cooperation between the regulatory agencies and collective decision-making, and for an explicit duty to be imposed on them to balance costs against benefits of regulatory decisions.

At present, most Latin American and Caribbean countries rely on administrative or "command and control" means for water resource and environmental management. The transfer of responsibilities from the state to the private sector will produce a need - this need is already detectable in those countries which have advanced most on the road of privatization - for greater reliance on prices and other incentives to encourage efficient use and allocation of water. It will also require greater user participation in water resource management.

Many of the benefits of private sector participation in water-related pubic utilities result from the provision of protection to necessary, but politically dispensable, water-related investments from general budgetary pressures. It also provides a means of tapping the greater pool of private capital to help finance them. This implies that the effect of regulation on social welfare depends critically on the investment behaviour that it induces in regulated firms. An adequate supply of private finance to the privatized water sector will only be forthcoming, if investors are confident that their investment will not disappear though direct expropriation or through creeping regulation and that they will earn a rate of return on the capital invested in the sector which is commensurate with the risk they take. It can flow quickly as the examples of Argentina, Chile and Peru illustrate. Potential investors need government commitment to respect, over the long run, their property rights, the rules and regulations governing tariffs, entry conditions, and expansion plans. It is essential, therefore, to develop a stable regulatory environment to encourage and maintain private investment in water-related services. Unless there is a stable regulatory environment, the rational fear of *ex post* opportunism by governments will deter efficient investment in sunk cost assets. The only secure route to private sector confidence is a history of rational government committed to policies encouraging private investment in public services. Governments must demonstrate that they do not indulge in *ex post* opportunism.

One effect of privatization will be to increase significantly the discount rate applied to investment projects as the discount factors used by governments are usually low. This means that privatization can affect the choice of technology. For example a higher rate of discount implies a bias toward less capital-intensive technologies and fuel choices in electricity generation. Thermal power may become the technology of choice rather than hydroelectric generation. There are signs of this change both in the larger economies such as Argentina and Chile, as well as in smaller ones such as Central American countries. Change can be expected wherever there are less-capital intensive technological solutions and where there is competition from less-capital intensive substitutes. Irrigation *vis-à-vis* rain-fed agriculture, and to a lesser significance water transport, versus rail, road or air, are other areas where privatization could produce important changes in the structure of investment. If a government decides to use subsidies to encourage the private sector

to follow a specific investment path, attention should be paid to the need to ensure that any subsidies are channelled to the most efficient companies and that they do not unduly interfere with the play of the market forcers.

Organising effective consumer involvement in the regulatory process will probably take time in most Latin American and Caribbean countries, as there is little experience of such participation. Water management has been characteristically highly centralized within the public sector and in central governments. One consequence has been highly centralized systems for service delivery which have a history of being unresponsive to customer demands and have been subject neither to market nor political tests of responsiveness. As a result, most of the population has never had to face the realities of the fact that water-based services are not free but have to be paid for. Moreover, it is not widely understood that the choice of service level should be made collectively and rationally in light of the costs and benefits to the community at large. Because decentralization shows that there is such an obvious need for consumer involvement, greater private sector participation stimulates greater consumer involvement. The experience of Mexico City is one example, but similar consumer participation is growing in Argentina with the granting of concessions in many cities.

Community participation is often an essential feature of the provision of drinking water supply and sanitation services in rural areas. Public authorities should provide an appropriate legal, institutional and policy framework to promote such participation. Studies clearly show that projects with high participation in project selection and design are much more likely to maintain the systems in good condition than those characterized by more centralized decision-making. Rural drinking water supply programmes should be demand-driven, any subsidies should not distort the community's choice, and beneficiaries should mobilize a considerable portion of the resources. Demand-side assistance, i.e. giving subsidies directly to households and not to utilities, should be encouraged because these ensure that the intended beneficiaries are properly targeted. There are grounds to believe that it may not be wise to assign responsibility for the provision of drinking water supply and sanitation services in rural and urban areas to a single private company.

Structural reforms should seek to isolate the natural monopoly elements in an industry and to prevent the firms entrusted with activities with natural monopoly characteristics from extending their monopoly powers beyond the segment of the market where these characteristics exist. Failures to isolate the natural monopoly elements and to create adequate competition can considerably complicate conduct regulation and make its task more demanding and its scope broader than necessary. Any failure will also impose on regulators the task of trying to compensate for the deficiencies in structure through more intrusive conduct regulation. Inappropriate

industrial structure is one of the main causes of regulatory failure and competition is the best form of control.

In Latin American and Caribbean countries, centralization meant water-related utilities were usually heavily vertically integrated to a degree that they include all operational and support functions, including those which do not exhibit natural monopoly characteristics. It is clear that many utilities could realize substantial cost savings and enhance efficiency through both horizontal and vertical separation by means of franchise arrangements with private firms. Many activities can and should be opened to direct competition. The examples are many, in fact almost everything except the overall coordination of activities could be contracted out in any system, although in practice this is not often done. The Mexico City franchises are an example, however, of what can be done in the separation of functions.

Horizontal separation into geographically discrete companies is almost always one of the accompanying features of any restructuring of any water-related service whether electricity generation, irrigation or drinking water supply and sanitation. None of the large national public utilities remain in South America and they are being reformed in all countries of the region with the exception of Cuba. Vertical separation is not so commonly found, but is growing both in those services which remain in the public sector and among those privatized. Argentina has established one of the most competitive and deregulated power markets in the world through the vertical and horizontal unbundling of the generation, transmission and distribution activities. The breaking up of large public entities into smaller public or private concerns can be considered a necessary requirement for improving efficiency and introducing competitive pressures if not actual market competition.

Functional separation is, however, by no means a panacea. Attempts to separate closely interdependent activities can impose high costs on the sector, including the loss of the economies of scale and scope, the costs of sector restructuring and the possible loss of some internalization of externalities, which need to be carefully weighted against the potential benefits of cost-minimizing behaviour under competitive pressure. If these factors are significant, there may be a case for the continuation of vertically integrated monopoly.

This paper has presented a review of the recent literature on regulation, including the experience elsewhere in the world and its applicability to the countries of Latin America and the Caribbean. As has already been said, changing the ownership of companies providing water-related services from the public to the private sector should be seen by governments as only one step in the necessary reform process to improve the efficiency of public utilities. The process of improving

the efficiency in the provision of these services is much greater than merely transferring ownership, investment must be encouraged, costs must be minimized and standards raised, but above all adequate incentives should be incorporated in the regulatory framework to encourage efficient resource allocation. The regulatory environment can help or hinder this process and governments in the development of regulatory policy must ensure that it helps not hinders and that, while protecting the consumer from monopoly, it provides a favourable environment for the activities of the private entrepreneur.

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