

The Critical Importance of Information: incentive regulation and its application in electricity

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Convergence of Light and Heavy Handed Regulation

(the critical importance of information)

Information is critically important for the design of effective regulatory schemes. Information asymmetries in which information and actions, can be hidden by individuals and organisations create informational problems. Informational problems are universally present and legal and organisational institutions have evolved to cope with them. They have led to the development of *incentive regulation* that relies on factors outside the firm to set regulatory parameters: these factors may include information about the firm's and allied industry performance, expectations of performance, or the performance of other firms. Informational issues, the structure of industries and the nature of competition are all affected by the speed and direction of technological change.

It is important that regulatory, governance and ownership structures evolve that do not impede the technological change that is enabling networks to be transformed into markets. In these circumstances, there is a presumption that private providers operating in a competitive market environment and subject only to standard competition and company laws provide the optimal governance structures for network industries confronted by rapid technical change.

Credible light-handed regulation provides the most predictable regulatory and commercial environment, and it permits decentralised adaptation to technological change. For light- or heavy- handed regulation of private firms to perform better than State-Owned-Enterprise regulation requires some commitment to property rights. As schemes shift from heavy- to light-handed regulation contract and competition law play a more important role.

Incentive regulation can be applied under heavy- or light-handed regimes. If it is designed to force industry change, or it is based on yardstick competition it is very likely to be heavy-handed regulation.

1. INTRODUCTION

For much of this century, regulation of commercial activity has had the following key purposes:

- to direct industries to meet social objectives: for example, the provision of “universal service” in telephony;
- to cater to the political goals of interest groups; and
- the promotion of economic efficiency, particularly in industries that have had natural monopoly characteristics.

There is a continuing world-wide reassessment of regulation. This has stemmed from the assessments of regulatory performance, and from public choice theories of regulatory behaviour and regulatory capture. Additional major contributory factors have been a better understanding of the importance of informational problems in organisations and the economy more generally, and the rapid technological change that is transforming industry structure. These two factors are not independent: technological change is altering the structure and efficiency of markets by reducing information acquisition, comprehension and storage costs, as well as by changing directly the characteristics of industry.

The advances in information economics recognise that information is valuable and costly to obtain. Furthermore, asymmetric information, wherein some individuals have particular relevant knowledge that they need not reveal, raises the possibility of individuals taking actions and hiding relevant information in transactions of all sorts. Recognition of this information asymmetry has spawned an industry in economics that seeks to better explain the functioning of markets and organisations, and which evaluates the design of institutions that would reduce informational costs. In the case of regulatory schemes, it has led to the concept of

Incentive regulation: regulatory schemes that recognise information asymmetry and seek to provide incentives for the regulated entity to perform well in pursuit of its own interest.¹

These schemes do not seek first-best outcomes, because they are recognised as unattainable when information is imperfect. Rather, they seek to attain the best outcome given the constraints posed by informational problems. Part of the design of incentive regulatory schemes entails consideration of incentives to reveal credible information, and the costs of scheme implementation. Disclosure regimes represent a mandatory approach to the revelation of information.

Much of this paper is about incentive regulation. It argues that whether incentive regulation is light or heavy depends upon how it is implemented: vigorous implementation will often lead to resource-demanding regulation.

¹ See Laffont and Tirole (1993).

A lot of the current technological and organisational change in markets, particularly networks, is being driven by very rapid advances in the use of electronics and the application of computer technology to industrial processes.² The implications of this change for industry performance vary between different markets, but all have been affected by reductions in their costs, changes in the availability and quality of information, the creation of new markets, and the opening of competition within and between markets.³ These changes have affected the optimal organisation, regulation and governance structures of network industries in two ways. First, they have challenged traditional public policy towards network industries by making competition feasible where natural monopolies existed before. This has occurred through reductions in the cost of technological solutions to interconnection between networks as well as through the potential for competition in the provision of core facilities within networks. In addition, the speed and uncertainty of technical change have affected optimal regulatory and governance structures as well. These have been analysed by Evans and Quigley (1998), who argue that light-handed regulation with private sector joint-venture governance arrangements offers the best route to economic efficiency.

Technical change, having altered the characteristics of previously natural monopoly industries, and facilitated entry, have rendered much more difficult the political economy objectives of regulation. There has been more focus on the objective of economic efficiency, since the 1970s. Technical change has also altered the cost and importance of information. It is altering markets and it is critically important for the efficiency of regulatory schemes. It bears directly on the issues of asymmetric information and moral hazard (individuals' hidden actions) issues

This paper outlines the key distinguishing features of light- and heavy-handed regulation. It:

- Provides an analysis of the importance of informational issues for the conduct of commerce,
- Provides an analysis of informational issues for the design and operation of incentive regulation,
- Uses incentive regulation to assess heavy- and light-handed regimes, and
- Analyses certain of the regulatory issues of the electricity market.

2. REGULATORY REGIMES

The general framework for the governance of industries, including network industries, may be divided into four categories:

² The substance of this discussion is unaffected by the sources of technological change. We would argue that there is no unique source or cause, and that technological advance and diffusion are influenced by institutional arrangements. (See Archibugian and Michie (1998) for some discussion of institutional and neoclassical approaches to understanding technical change).

³ By competition between markets is meant that the gaps in the chain of substitution possibilities between goods (Tirole, 1988, 12-13) have narrowed or vanished leaving fewer, larger markets: an example is the convergence of modes of communication.

- 1 *Light-handed regulation.* Here, the governance structure is provided by the operations of private sector firms and the contractual relationships associated with the market. The role of government is confined to the establishment of a framework for property rights and competition policy. This structure includes voluntary industry self-regulation and joint ventures between competing firms. The key feature of this regime is open entry and an underlying presumption that competition is desirable. Light-handed regulation precludes statutory restraints on entry and on-going specific regulation based on the state of the market.
- 2 *Government recognition of industry self-regulation.* This governance structure provides statutory recognition of policies agreed by market participants. It encourages co-operation among market participants, as well as the planning of development and competition.
- 3 *Heavy government regulation of private market activity.* The governance structure established here is statutory in nature and shaped by regulatory policies and interventions that are industry specific, and may include restrictions on entry, requirements to undertake certain activities or to implement cross-subsidies, and restrictions on rates of return.
- 4 *Direct public sector provision.* This entails community and government ownership of firms, and legislative recognition of state monopoly provision of the service. This governance structure implies both government regulation and government ownership.

This schema illustrates that regulation, and contract and competition law are inextricably linked, and that the importance of these legal institutions increases in going from category 4 to category 1. Note that under heavy-handed regulation there is usually a statutorily-provided industry governance structure. Whereas under light-handed regulation, where industry governance structures do take place they will take the form of joint ventures.

It is apparent that price regulation, at least as it has been implemented in the past, has a broader array of objectives than have generally been held by either competition law or contract law. It is also noteworthy that it has been common to inhibit entry as part of regulation. Indeed, this is why the objectives, other than economic efficiency, have been feasible options for long periods. In this paper the goal of regulation is presumed to be enhancement of economic efficiency, the public choice analysis of interest groups and income transfers are not considered.⁴

Traditional industry-specific regulation of privately held firms is exemplified by rate-of-return regulation that has been the method of choice in the USA since around 1912.⁵ This form of regulation has been quite invasive in that regulators directly affect a range of company decisions. Rate-of-return and cost-based regulation will be taken as falling into the heavy-handed category of regulation. They will not be discussed in any depth, except to indicate that there is a widely held view that as normally specified these approaches have not

⁴ Indeed, a distinguishing feature of New Zealand's reform programme since 1985 has been to handle social concerns, including income distribution, through the tax, social welfare and health programmes, and to promote economic efficiency in markets.

⁵ Rate-of-return regulation can take various forms. The term is here used broadly, it encompasses regulatory regimes where prices are set on any sort of a cost-plus basis.

furthered economic efficiency (see Newbery (1998), Hausman (1997), Harris and Kraft (1997), Waverman and Sirel (1997), and Spiller and Gardilli (1997)). These conclusions reflect the multiple objectives, often entry inhibition practices and inattention to informational problems of this form of regulation. Whereas Newbery op cit infers that incentive regulation is preferable, Spiller and Gardilli op cit go further in advocating light-handed regulation, perhaps buttressed by minimal intervention to promote entry. These assessments of cost-plus and rate-of-return regulation are also generally applicable to regulation by government ownership.

Although, light-handed regulation is subject to the threat of direct regulation, this does not set it apart from the more invasive forms of regulation. All forms of regulation are subject to the threat of Government-mandated regulatory change. In addition, they are all subject to judicial review and self-regulatory enforcement, and both can accommodate social goals while these are feasible. They can all be accompanied by disclosure regulations.

If there is to be convergence, or compromise, between heavy- and light-handed regulation, it most likely would take place through the vehicle of incentive regulation. Which category this form of regulation falls into depends critically upon how it is implemented. Because incentive regulation has emerged to deal with the informational problems of regulation, it is the subject of much of this paper.

3. INFORMATION ISSUES

Information issues have dominated the development of major areas of economics over the last 20 years. Young (1996) points out that Adam Smith's famous invisible hand theorem in which selfish individual action results in outcomes that are unforeseen but in society's interest was anticipated by a Han Dynasty historian Sima Qian (145-87 BC) some two centuries earlier. His statement:

There must be farmers to produce food, men to extract the wealth of mountains and marshes, artisans to process these things and merchants to circulate them. There is no need to wait for government orders: each man will play his part, doing his best to get what he desires. So cheap goods will go where they fetch more, while expensive goods will make men search for cheap ones. When all work willingly at their trades, just as water flows ceaselessly downhill day and night, things will appear unsought and people will produce them without being asked. For clearly this accords with the Way and is in keeping with nature (Young (1997, 138)).

goes further than Smith because it provides a role for prices. It is prices that convey information in a de-centralised economy. This role of prices has been perhaps the major research agenda of economics for the past 40 years; in particular, the link between the acquisition and use of information and prices. Where information is costly to obtain, store and process, the possibilities of hidden actions and hidden information by individuals become major issues in transactions of most sorts. Informational problems stem from asymmetric information (hidden characteristics) and moral hazard (individuals' hidden actions) that greatly complicate management, governance and regulation. Incentive regulation sets out to de-couple firms costs from the regulatory determination of prices, and thus enable the firm to

be the residual claimant of profit. In addition to price-cap regulation, incentive regulation would, where there are groups of firms to be regulated, include some forms of “yardstick” competition whereby the relative performance of different firms is used.⁶

Contract law has long recognised this issue and institutional approaches have evolved to enforce agreements represented by contracts, and in so doing distinguish what Williamson (1989) calls opportunism from behaviour that is in the spirit of the agreements. Regulatory mechanisms that are designed to address this opportunistic behaviour have come to be known as incentive regulation. Because this opportunism is an intrinsic part of human nature and the economic environment, or is sufficiently so to make it universally important, it is present in all economic environments. Different governance structures deal with it in different ways. The different structures that are relevant for regulation are listed in the introduction. The implication of these informational problems will be considered for light-handed regulation, government ownership of a State Owned Enterprise and incentive regulation.

3.1 Incentive Regulation

Under this form of regulation, schemes are designed to provide incentives for firms acting in their own self interest to deliver in the public or the regulator’s interest, even though they have information and are capable of actions that the regulator cannot observe at any reasonable cost. These schemes take the informational problems as constraints on what can be achieved by regulation and, using observable data, seek to induce firms to behave in the regulator’s interest. As part of the design, incentives for the revelation of credible information are also considered.

The basic objective of incentive regulation is to decouple a utility’s price structure from its own reported costs: this preserves incentives for the firm to act efficiently in its self-interest while meeting regulatory objectives. Various approaches have been proposed and many of these are surveyed by Baron (1989). Incentive regulation has been applied particularly widely in electricity by Public Service Commissions in the USA. Applications have included: capacity availability, fuel costs, heat rate measures, conservation-related measures non-rate-base plant performance measures, line loss construction cost caps.

Incentive regulation is typified by price caps that take the form whereby an index, $rpi-x$, is applied to some historical level of prices, where rpi is an index of inflation and x is fixed by the regulator. For the case of a single, or very dominant firm, x should be set on the basis of information that does not include the firm’s costs: the firm is then the residual claimant of profits. It has been suggested that historical profits be used to set x ⁷: but this immediately offers the opportunity of x being set by strategic behaviour of the firm. More recently factors such as the forecast of the rate of technological change in the industry, and allied industries, may enter into the calculation. In UK telecommunications it has been based upon cost models that are debated between the dominant firm and the regulator and which include assumptions as to technological change (Newbery (1998)). While this approach can alleviate some of the problems of rate-of-return regulation it is still invasive and demanding of regulator input, and expectations of the future.

⁶ An early proposal for yardstick competition is Shleifer (1985).

⁷ See Vogelsang (1990) for discussion of this issue.

Incentive regulation may or may not be invasive, or resource demanding, depending upon implementation. In UK telecommunications, it has been much more invasive than has been the case of price cap telephony access fee for households in New Zealand: it is set independently of profits – or any other industry performance indicator for that matter.⁸

For a group of firms, yardstick competition is a possibility. Following Shleifer (1985) comparable firms are set a price cap based on the average unit costs of all other firms in the group. Taking this price as given the firms choose the optimal output.⁹ The critical feature of this scheme is that firms regard the price as beyond their control. More generally, arguments that yardstick competition may mimic actual competition rest on assumptions that

1. *Commitment*: all firms must be certain that the regulator will not change the basis of the price cap, or the regulatory scheme in other ways for considerable periods of time, and the firms are committed to maximising profits.
2. *Collusion*: the firms do not collude and implement concerted actions that affect industry wide costs. Because collusion is easier for small rather than large groups, collusion may become more likely if mergers take place, and
3. *Comparability*: if there are variations in cost that occur because of characteristics of the business that are not able to be influenced by the business, and which vary across firms it may not be feasible for certain firms to participate in the regulatory scheme. In this case, if the varying characteristics are observable and measurable and the impact of these characteristics on costs can be quite precisely assessed, then the price cap should vary across the firms based upon these characteristics.

Commitment is difficult to achieve, especially if it relies upon prominent sanction by the government of regulators. Comparability, is also a difficulty because it requires that the exogenous characteristics that vary across firms are measurable and that their effect on cost is known or can be accurately estimated. As Weyman-Jones (1994) points out, such information goes well beyond the customer and financial service data that may be collected from firms under disclosure regulations.

Electricity distribution companies with regional exclusive territories and common elements have been the subject of yardstick competition. For Sweden, Kumbhakar and Hjalmarsson (1998) report that there were 300 distributors in 1990, and that yardstick competition took the form of price comparisons with nearby distributors and the threat of removal of a concession to operate and threat of amalgamation. Their productivity study exhibited some unexplained variation,¹⁰ but suggested that the smaller private firms were relatively more efficient than the, largely urban, municipally-owned firms. This was attributed to the form of regulation, but

⁸ In this price cap $x=0$.

⁹ Note that at the date the scheme starts, observed unit-costs averaged across all firms need not be the desirable unit cost.

¹⁰ Important variability in results was also reported for a productivity study of the Norwegian electricity distribution sector (181 entities) by Førsund and Kittelson (1998). This study was conducted to ascertain past productivity growth rates and other factors preparatory to implementing incentive regulation. The results provide productivity indicators for individual distributors, but confidence in them is adversely affected by the presence of outliers.

they point out that because the benchmark was the municipally-owned firms that were subject to a zero profit constraint, there was no pressure on absolute efficiency.¹¹

Weyman-Jones (1994) reviews various studies of the productivity of the UK electricity distribution system with a view to assessing yardstick competition in this sector. Using a deterministic data envelopment technique he found that the companies gained efficiency, and converged in efficiency standards, as they approached privatisation: but that which distributor was relatively efficient varied significantly between years. He was able to explain some of this variation by variations across regions in business cycles. This importantly suggests that yardstick regulation should take the state of regional business into account, but if it were to do so the price cap may vary significantly over time. This variation also suggests limitations of the deterministic methodology for data analysis: the productivity-measurement technique should allow for random variation across distribution regions as well as systematic differences in causal efficiency factors. Applying an approach that permits this separation¹² Button and Weyman-Jones (1992)¹³ concluded that there was negligible variation in efficiency across distributors, and that most of the observed variation was simply random.

Comparability can be assessed by reference to random factors that affect costs. If these are sufficiently strongly correlated across companies then companies are sufficiently similar for yardstick regulation to be more effective than individual regulation of individual firms. If, however, this correlation is weak, as Button and Weyman-Jones (1992) found for the UK electricity distribution sector, then yardstick regulation is not useful.

All the studies mentioned suggest problems in controlling for factors that vary across regions and that should be controlled for if yardstick regulation is to function well. This means that yardstick regulation will generally require significant investigative work that involves auditing and bargaining activities. These factors, activities and the strength of correlation across regions will frequently all offer bases for instigating judicial review. These suggest it unlikely that yardstick regulation will provide a minimally invasive, and inexpensive mode of regulation.

It is worth noting that the structure of the yardstick approach, including as it does informational problems, offers a framework for considering the performance of informed competition in electricity distribution. The yardstick approach of Bivand and Szymanski (1997) provides a framework within which a start can be made on analysing the performance of an informed, versus an uninformed, firm wheeling into a region. If costs are sufficiently correlated between regions a yardstick contract may wish to be written by an informed firm, otherwise independent contracts will be bargained over. This marks a return to the original independent-contract vis à vis yardstick-contract comparison of Green and Stokey (1983).

3.2 Light-Handed Regulation

The informational problems are present under all governance structures including private markets. Evans and Quigley (1998) argue that, even for network industries, that light-handed

¹¹ Mizutani (1997) reports weak evidence of cost reductions from yardstick competition in Japanese railways. The commitment factor may have been quite strong here because the competition worked through applications for price increases, rather than forced cost reductions.

¹² The approach was that of Aigner, Lovell and Schmidt (1977).

¹³ As reported by Weyman-Jones (1994).

regulation is the desirable regulatory arrangement. The changes in industry structure, the implications of the uncertainty and pace of technological change for prediction and co-operative relationships make heavy-handed industry-specific regulation inferior. They argue that governance that entails co-operation among industry members is best achieved by joint venture arrangements in which there are not statutory impediments to exit and entry.

In light-handed regulation the commitment factor is its most strong. Commitment is achieved by the discipline of competition and competition law. The operational rules are at their most separate from political and derived administrative influence. In addition the responsibility for investment and profit performance rests with the companies, making their objectives more time invariant and focussed. These factors combine to provide the strongest form of regulatory commitment. This conclusion presumes no regulatory oversight that actively threatens regulation based on immediate industry performance. In practice this threat is always present to some degree. It is present in all regulatory schemes, and arguably is weaker in light-handed regulation.

The performance of light-handed regulation will then depend on active entry, and competition law. Importantly, the law of contract has a critical role to play in the efficacy of light-handed regulation. The law of contract has evolved in sifting opportunistic behaviour affecting agreements, from behaviour which is in accord with the intent of agreements. This winnowing action of the institution of contract law attempts to address the informational problems that bedevil transactions.

The ability to enter into arrangements between parties that last for (long) periods of time provides the framework and surety for investment in many capital intensive and long-lived assets. Infrastructure assets are “specific” (ie have very specific uses) and this together with their long lives, and, often, substantial size makes them vulnerable to opportunism by parties to the contract. If parties can use a wide array of pretexts to break contracts with little cost to themselves, then it will be difficult to enter contracts in the first instance. If it is difficult to enforce contracts then parties to any contract may act opportunistically by observing the *ex post* outcome of the contract and deciding not to honour the agreed terms and conditions if such action is in their private interest. In such cases, the legal framework for contracting fails to provide commitment¹⁴ and the writing of contracts (especially those relating to investment in key assets) will be inhibited.¹⁵ Inability to enter time-consistent contracts also provides an incentive for vertical integration: to create certainty about what would otherwise be a contractual arrangement. Certainty in the function of contract law improves the commitment and the consequent performance of light-handed regulation.

The purpose of competition statutes is to identify and prohibit market place conduct that reduces competition and is not in the public interest. In New Zealand this is accomplished by the Commerce Act 1986. Key aspects of this legislation include an absence of industry-specific provisions and the absence of prohibitions on specific anti-competitive practices (retail price maintenance being the only exception). The Commerce Act makes unlawful

- actions that exploit a “dominant position”; and

¹⁴ Commitment to the essential ingredients of a contract or other organisational arrangements as time progresses and more information is revealed is termed time consistency.

¹⁵ Alternatively it may stimulate alternative arrangements such as mergers (Goddard (1998)).

- mergers that result in strengthening of market dominance

Actions and practices can be authorised on a case by case basis. The criterion for authorisation is that of economic efficiency (the present value of producers' plus consumers' surplus). The Commerce Act embodies the notion that competitive markets form the efficient institutional structure for the delivery of goods and services and performance under such arrangements provides a notional benchmark against which actual actions and practices are assessed. Competition is, however, a mechanism for the achievement of efficiency rather than the ultimate goal of competition policy.

The commitment aspect of private sector contracts is an issue for New Zealand commerce. In the past many of the major investments have been underwritten by the taxpayer because much of the very large project contracting was either with government because it owned the resource, or by government because it owned the contracting firms. Taxpayers have typically carried the risk, and there has not been the focus on commercial objectives of the government-owned entities that would tend to predispose opportunistic behaviour. One lever that can be employed opportunistically is the application of competition law to contracts. While contracts are properly subject to competition law, the very possibility of parties modifying an established contract using competition law may reduce the commitment of the institution of contract: specific examples and issues are discussed by Dammerly (1998) and Goddard (1998). If commitment is low, then the efficacy of light-handed regulation will be adversely affected.

Light-handed regulation is generally accompanied by disclosure regulations. The efficacy of competition is likely to be affected by disclosure, but it can have various effects. It may inform entrants, but it may also be used to co-ordinate actions at the expense of efficiency. The process of dispute resolution can provide incentives for the revelation of information where informed firms are involved. For example, the costs of telecommunications transmission have been voluntarily revealed in the process of disputes between carriers entering each other's regions. However, the disclosure of credible information and its effect on competition and economic efficiency is generally complex.

3.3 Government-Ownership Regulation

Informational issues are present in all organisations, including those that are government owned. This combined with distinctive differences between these ownership forms can affect performance. Because government ownership typically entails ownership of a dominant firm it represents an important form of regulation. Indeed, for much of New Zealand's history it has been the common regulatory mechanism for these firms.

There are a number of features that distinguish privately-owned and state-owned firms. One widely accepted feature is that the objective of government-owned entities is less firmly committed to commercial outcomes (eg profit maximisation). Even if this is not the result of lack of clarity in a State Owned Enterprise (SOE) statement of corporate intent, or SOE board focus, the fact that over the long haul political views change ensures a difference between the two classes of ownership in their managers' commitment to commercial objectives. The other key proposition that is widely accepted is that a firm has the same hidden action and hidden information problem no-matter whether it is in the private or public sector: that is, private

and public sector CEO's face the same sorts of informational problems in running their organisations, and they know more about their entities than do their boards or owners.

Willig (1993) presumes that a regulatory scheme is to be designed for the same firm in the private and public sectors. He uses incentive regulation.¹⁶ Given that the public sector firm is less committed to commercial objectives, he applies incentive regulation to a public sector and a private sector firm, and then examines the performance of each. Willig's (1993) conclusion is that the performance of private firms will be unambiguously superior to that of publicly-owned firms because of the clear objective function of profit maximisation for private firms. The stronger commitment to profit maximisation of the private sector firm makes its behaviour more predictable and therefore the regulator can design a more effective regulatory scheme.

This finding holds true where the private firm is regulated, so long as private property rights are preserved. In Willig's result, secure private property rights that guarantee the ability to obtain future returns on investments and thus provide a basis for efficient decision-making are necessary for the performance of regulated private firms to be superior to publicly-owned firms.

The rate-of-return regulation used in the USA has impaired efficiency in the allocation of resources and the configuration of networks, but it has respected private property rights.¹⁷ To avoid confiscation of private property, assets purchased under rate of return regulation but "stranded" by deregulation are today being compensated in a way that impedes economic efficiency. This is a subtle reason why light-handed regulation may be desirable: its minimal distortions to productive, allocative and dynamic efficiency result in industry institutional evolution rather than regulatory upheavals and planned transitions that may conflict with efficiency.

This concludes the review of approaches to price regulation. It is noteworthy that if incentive or light-handed regulation are to perform better than state-enterprise regulation, property rights must be reasonably secure. Competition and contract law grow in importance as regulation approaches the "light-handed" end of the spectrum. Incentive regulation is likely to be very invasive, unless x is simply set equal to zero. It is likely that light-handed regulation is favoured in this period of rapid technological advance and if economic efficiency is the focus of regulation.

4. ELECTRICITY

The reform of the New Zealand Electricity industry has lagged behind in New Zealand's 1984-1995 economywide reforms (see Evans, Grimes, Wilkinson and Teece (1996)), and both public policy and the structure of the industry are still evolving. Technological advances

¹⁶ Given multiple objectives, or a different objective from profit maximisation, designing an appropriate organisation structure for government-owned entities faces the same problems and issues as those of the design of incentive regulatory schemes.

¹⁷ The Decision Hope Natural Gas Case of *FPC v Hope Natural Gas Co*, (Supreme Court of the US, 1944, 320US391, 345.Ct,281,88 l.Ed.333), established a basis for property-right preservation under rate-of-return regulation.

of the last five years have made feasible a range of new approaches to competition in electricity markets, and these are now central to the reform that is being undertaken.

4.1 Electricity Sector

In 1903 the Government passed legislation vesting in it the sole right to use water for generating electricity (see Beeche (1950) and Speer (1962)). From about this time it began investing in electricity plants and acquiring those existing plants that were privately held. The special-purpose Government department that owned and managed generation and the national transmission grid dates from 1961. Distribution networks were typically of a community trust form, or departments within local government. The path of change is illustrated, in Table 1.

To date, New Zealand's standard light-handed regulatory regime has been applicable to the electricity market: open entry is permitted and there has been no industry-specific price control. Any consumer is able to choose their supplier. Final purchase of electricity sourced from outside a retail area is currently 7% of total electricity dispersed by retail companies.¹⁸ This represents some discipline on the pricing of area retailers but the extent of this effect will depend upon the existence of other barriers to entry.

Culy, Read and Wright (1995) report that real wholesale electricity prices declined by 8 percent between 1987 and 1991, and that between 1991 and 1995 they were roughly constant in real terms. More recent data¹⁹ indicate that the wholesale price of electricity has declined in real terms between 1995 and 1997 by approximately 10 percent. During this time there has been substantial price re-balancing as residential prices have increased in real terms, whereas those for commercial users has declined. Prior to 1988 New Zealand cross-subsidised households and even now the price for commercial and residential customers is very similar.

Table 1
Evolution of the New Zealand Electricity Industry

1961 to 1987	generation and transmission - Vertically Integrated Monopolist Central-Government Department distribution - 94 electricity supply authorities Trusts and Local-Government Entities
1987-94	generation & transmission - Vertically Integrated Monopolist corporatised as an SOE distribution – local government entities corporatised
1998	generation (large) – 2 SOEs, more private generation transmission - SOE distribution (37): 7 listed companies, 28 community trusts, 2 co-operatives spot market from 1 October 1996

¹⁸ See Ministry of Commerce, *Electricity Information Disclosure Statistics*, 1997, p.19

¹⁹ Source, Ministry of Commerce, unpublished paper, (1998).

1999 Prospective

generation (large) – 3 SOEs, 1 private
some private generation

national grid transmission - SOE

distribution (37): lines, listed companies, community trusts, co-operatives

(37): energy, listed companies, community trusts, co-operatives

spot market from 1 October 1996

New Zealand has retained public ownership of generation and transmission, and its division of generation into two companies provides only limited competition. In addition, community trust ownership dominates the retail distribution.²⁰ New Zealand's absence of price regulation for households allows price re-balancing to continue and for price signals to be imparted to consumers.²¹

The delayed start on electricity de-regulation is apparent from Table 2. It reports estimates of the rate of technological and organisational efficiency gains from three sectors. The total factor productivity it reports can be interpreted as the percentage growth in output over time that would be obtained if all inputs were held constant.

Table 2

New Zealand Total Factor Productivity by Infrastructure

Sector, 1978 - 1993

Average Annual Percentage Growth Rates, March Years

²⁰ Culy, Read and Wright (1995, 59-71) canvas reasons for this choice of structure. It is well known that the trust form of ownership and governance means that the objectives of the board and managers are quite unclear and, for community trusts, open to political influence. It also limits capital market disciplines on management. In fact, 7% may represent considerable "wheeling" for that subset of customers for which "wheeling" is currently economically feasible. The situation is changing as the market restrictions alter costs and nature of meters change.

²¹ A Bill that split retail electricity entities into line and energy firms was enacted in June 1998. It exacerbates the trust ownership and governance problems.

	Actual Rates			In Business Cycle Context		
	1978-93	1978-85 'Pre Reform'	1985-93 'Reform and Beyond'	1979-92 Full Cycle	1979-87 Expansion Phase	1987-92 Contraction Phase
Electricity, Gas & Water	2.22	3.20	1.34	2.74	2.75	2.69
Transport & Storage	3.97	3.06	4.82	3.84	2.32	6.30
Communications	6.26	4.05	7.36	6.18	4.93	7.22

Source: Extracted from Hall (1996, Table 6)

Figure 1

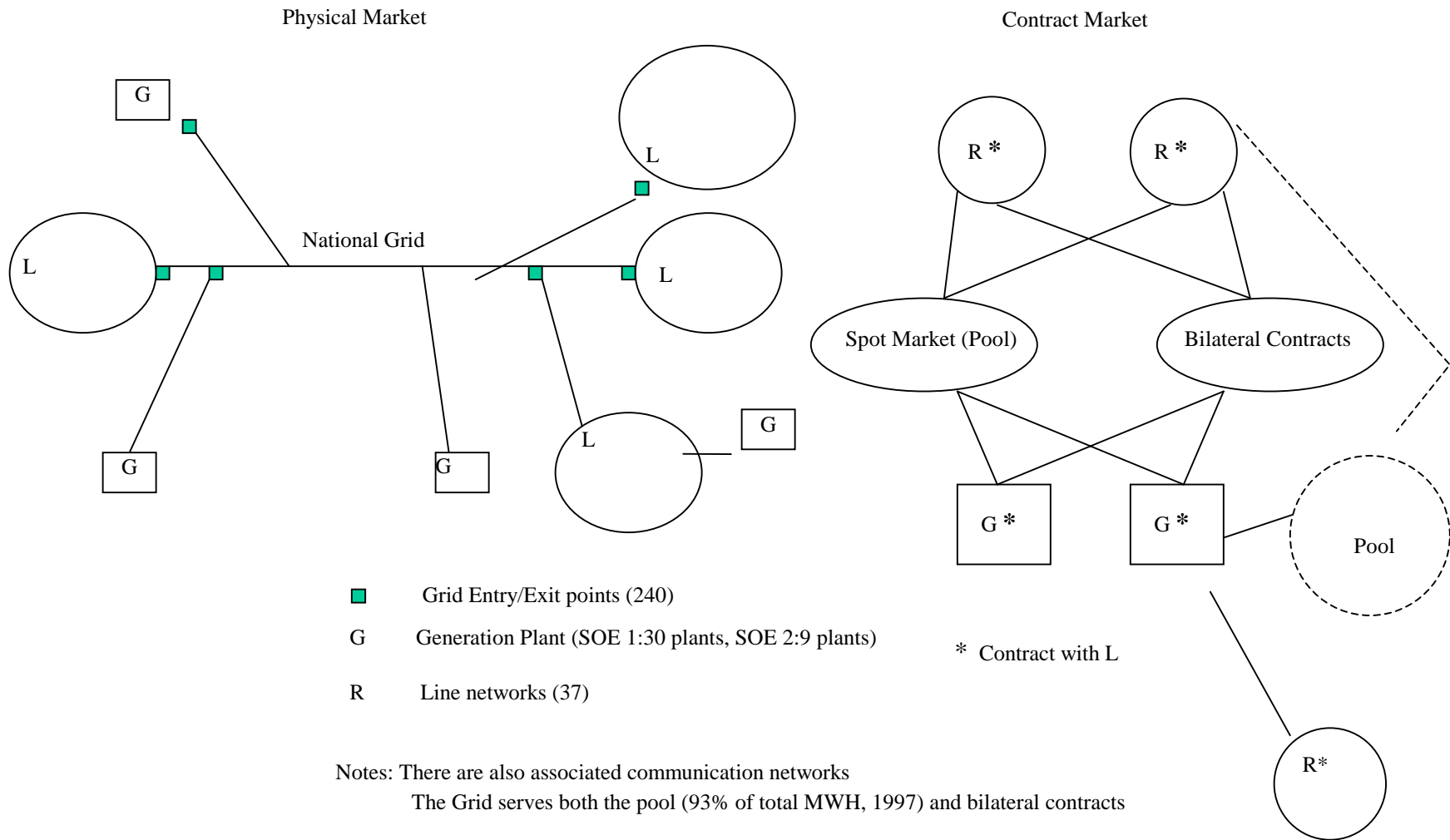
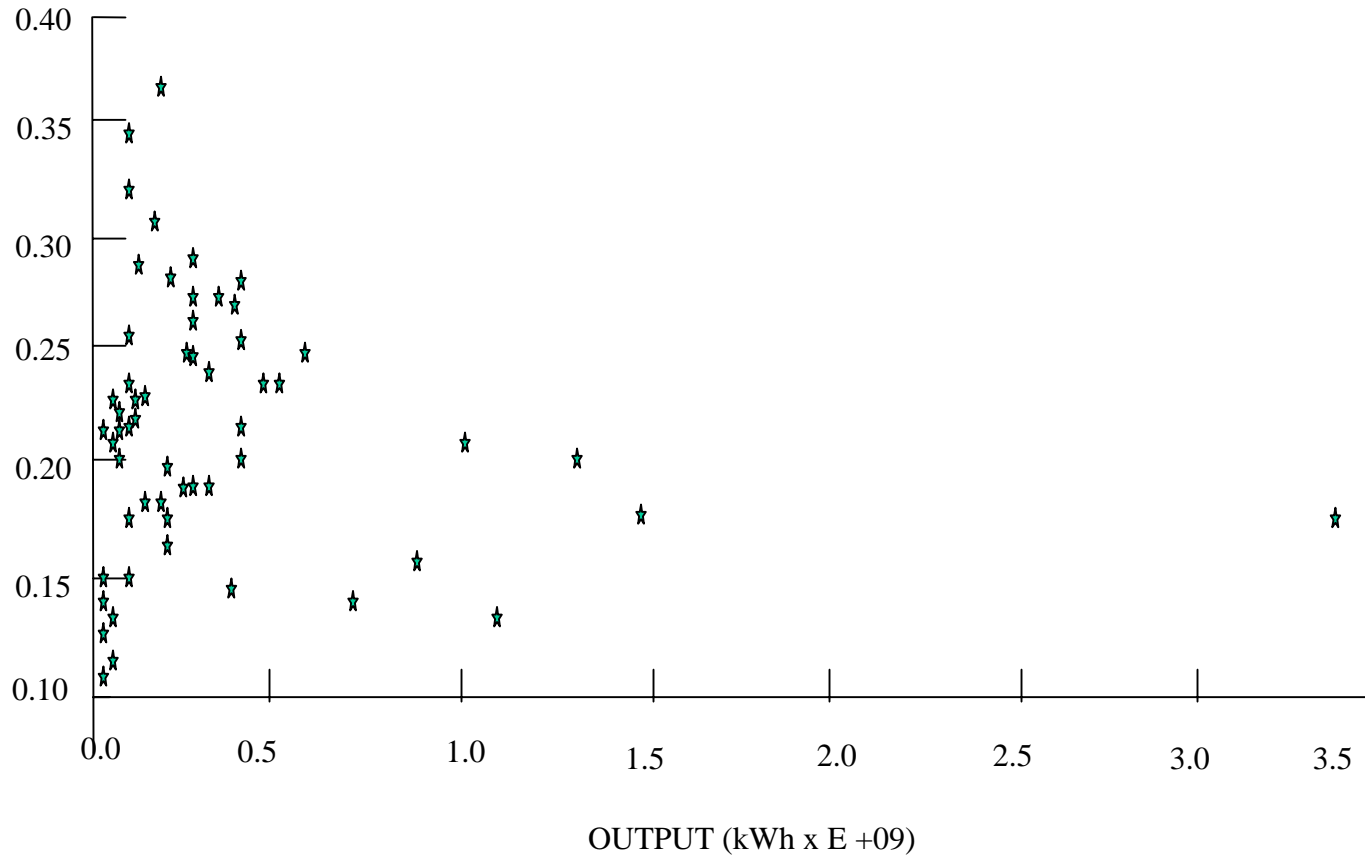


Figure 2

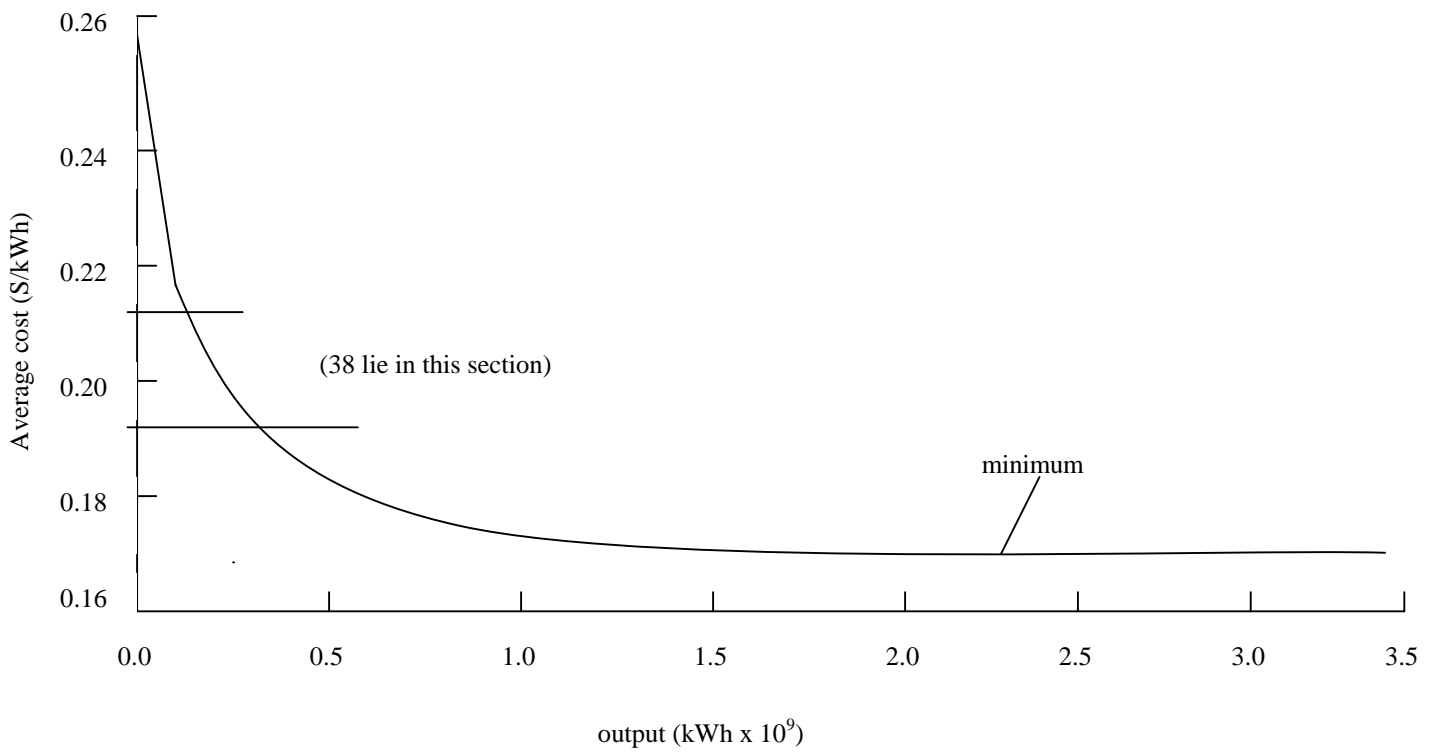
Actual Unit Cost



(Wyatt et al, 1989)

Figure 3

Estimate of Average Cost Curve



34	18	4	3	0	0	0	1	
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ESAs (frequency distribution)

While there are important measurement issues that imply that these estimates should not be regarded as precise, their differences are informative. The much higher performance of the very de-regulated sectors that are characterised by private ownership, stand out from that of electricity over this period. Of course, the communications growth rate will reflect the higher rate of technological progress in telecommunications.

4.2 Electricity Regulation: governance

The governance structure of the New Zealand electricity market does not include a statutory industry-specific regulator, or specific price control. There are two core sets of market rules. The Grid Operation Security Policy (GOSP) is implemented by the state-owned enterprise (SOE) managing transmission (Transpower). The development of GOSP is conducted by Transpower jointly with the market administrator (the joint venture Electricity Market Company, EMCO²²). EMCO has the responsibility for administering the rules of metering and reconciliation that apply to the entire wholesale market. It also manages the electricity spot market.

The electricity spot market, or pool, has its own governance structure. The physical networks and contractual networks, including those applicable to the pool, are schematically described in Figure 2. Participation in the pool is voluntary. The operation of the pool is defined in the NZEM rules that specify all aspects of the participation in, and operation of, the spot market. Service providers (eg. the Grid Operator, the Dispatcher, Pricing Clearing and Settlement functions) provide the services required for the operation of the pool under fixed term contracts under the rules of NZEM.

The entire governance structure of the pool exists by virtue of contractual obligations set out under rules developed by the market participants through a joint venture company EMCO. There is no statutory specification of governance. EMCO manages the rule development process as well as administration of the rules. It has played a significant role in the development of the spot market. It services a committee (the Market Surveillance Committee (MSC): MSC members are chosen by market participants²³) that supervises spot market monitoring (against the rules) and acts in a judicial capacity with respect to breaches and interpretations of the rules. The MSC has very extensive powers, and its decisions are subject to appeal, again to an industry appointed judicial board.

Electricity poses risk management issues that are of at least as much import as any networks. They are of concern to market participants and consumers directly. In addition, they have been of such political concern that they have affected the speed with which a devolved system has been allowed to develop. This is a factor in the current review of a governance arrangement that is to take over from GOSP and specify the operating standards of the grid, and, insofar as they affect the grid, ancillary networks. It is to be hoped that the revised governance structure has minimal specification of standards so that, under pool and non-pool contracts, there will be minimal specific assumption of risk unless it is specified in contracts,

²² EMCO is currently for sale. Not all market participants are owners of EMCO.

²³ One factor in the choice of members of the Market Surveillance Committee is independence from the day-to-day operation of the electricity market. This could in itself be an interesting subject for a study of governance design.

or specifically affects the security of the grid.. That is, market participants are free to contract for risk and thus the allocation of risk will reflect participants' abilities and willingness to accept risk.

The pool is voluntary; thus there are open entry and exit constraints on its exercise of market power. Furthermore, in addition to bilateral contracts, there exists the possibility of the establishment of other local pools by local retail and generating companies. This too constrains the actions of the current pool. It can be anticipated that these constraints will become more intense with entry into all facets of the electricity industry. Additional members increase the internal co-ordination problems for the joint venture. More profit-maximising participants in the market as a whole will add to the competitive constraints on pool organisation. As Evans and Quigley (1998) have argued, the rapidity of technological change shortens planning horizons and individual company action will generally be quicker than actions arrived at under a joint venture. These factors suggest that unless there are very great natural monopoly characteristics solved by the pool that the electricity market will evolve to a decentralised market system providing open entry is sustained. This process may be greatly facilitated by the fact that the joint venture company itself does not own any infrastructure assets.²⁴ The inclusion of such assets in the joint venture - as may have been expected given the specific nature of certain of these assets and that this is a common rationale for joint ventures (Phlips (1995, 173-4)) – may have delayed any joint venture re-arrangement driven by competitive forces.

The performance of the pool and the concomitant spot price should change with the further division of ECNZ, into three generator companies under the Electricity Reform Act 1998, and the possible privatisation of Contact Energy. Economic theory suggests that a move from 2 to 4 competing companies will make a substantial difference to the vigour of competition.²⁵ It has also been noted by Wolack (1998) that government ownership of the generators may have been a contributing factor in the low price volatility of the spot market over the period of his data. He attributes this to muted profit objectives of government-owned generators.

The basic lesson of the New Zealand model is that governance arrangements that predispose effective co-ordination and control can be constructed under voluntary contracting among decentralised decision-makers. It has been carried out under light-handed regulation with the sanction of government. The open entry and exit and the absence of regulatory restrictions on activity, that is part of light handed regulation, has facilitated industry change. It also may have been facilitated by central government ownership of generators and the grid.

4.3 Electricity Regulation: distribution

Prior to the 1998 Electricity Reform Act, light-handed regulation was applicable to the grid and distribution. In fact, because of regulatory oversight and government ownership of the grid that,

²⁴ It does have an information system that keeps any subscriber continuously up-to-date with the state of New Zealand's electricity system, including the state of the hydro-lakes.

²⁵ This statement refers to the SOEs. Although there are other generators the two existing SOEs have the bulk of the market.

from 1997, specified an efficiency objective, the regulatory regime was a mixture. The grid has used an implicit rate-of-return approach to setting prices, and distribution companies have known that their price and cost performance had a significant probability of affecting the possibility of the imposition of regulation and its nature. This background may have affected the distribution companies' belief in the long term stability of the regime, and their focus on their own efficient performance.

With the introduction of the 1998 Electricity Reform Act the distribution sector is changing markedly. The 37 distribution entities are separating into line and energy entities and all generators may engage in retail. Whereas generation and energy retail can be conducted by the same entity, lines businesses cannot retail energy. The result is stimulating change, including portfolio changes that are aimed at garnering other economies of scope for both the energy and lines businesses. These economies may lie in the joint customer interface of gas, electricity and, perhaps, telecommunications delivery. For lines businesses, these same industries may provide economies of scope. In this respect the changes will stimulate the formation of the multiproduct forms that characterise the UK utility scene.²⁶ Light-handed regulation will allow these agglomerations, subject only to satisfaction of the Commerce Commission's merger guidelines.

The lines businesses, however, will be subject to detailed disclosure requirements. The stage seems set for yardstick regulation, or the threat of it. This section concludes by reviewing issues that this poses.

Consider the issue of comparability. In the absence of data on the lines businesses themselves, let us consider the very careful study of Giles and Wyatt (1992). Although, the study is now dated and it does not separate lines and energy, its key feature may still apply. The raw data of unit cost of all ESA's are plotted in Figure 2. The variation in these data will be due to

- random factors and factors that are under the control of the distribution entity, and
- regional factors that are largely beyond the distribution entity's control, including (potential) market size and density.

Figure 3 shows the average cost curve that was estimated by Giles and Wyatt (1992): it shows the average cost as output (MWh) increases holding constant measurable factors that are beyond the control of the companies. The curve gives the mean average cost at each output level, so it eliminates random variation that appears in the raw data. Its key feature is that as output increases average cost in distribution falls substantially.

This cost structure must be interpreted very carefully. In particular, although customer density is controlled for, Giles and Wyatt (1992, 374-380) stress that other factors that differ across regions have not been included, and others that they attempted to include did not yield sensible results. If some of the decline in costs that occurs as output expands is due to economies associated with regional factors that are positively correlated with output then declines in the curve will not represent simply economies of scale.²⁷ The cost structure of Figure 3 will be due to various

²⁶ See Madden, 1998

²⁷ There various results about the existence of economies of scale in distribution. Salvanes and Tjøtta (1994) examine Norwegian electricity distribution and conclude that costs are substantially affected by density and that if density is accounted for, economies of scale in output vanish at all but very small output levels. Wyatt et al (1989) find that there are economies of density, but they get inconsistent results with other regional factors; specifically, measured urban/rural and load factor variables.

influences, but no matter the combination of factors it has implications for yardstick competition. Consider two polar cases.

First, if the cost curve does account for regional factors completely, then the graph suggests that there are economies of scale. In this event (average cost) price caps should vary across firms as their output varies if they are to squeeze profits and maintain viability. This has the effect of making the price cap depend on the companies' specific output and levels, which yardstick competition seeks to avoid. Price caps may influence mergers: if these are lower for larger output ESAs mergers may be inhibited.

Second and alternatively, if declining costs are entirely due to regional differences in exogenous factors that are correlated with output,²⁸ then variations in these factors should be reflected in yardstick-price caps that vary across ESAs.²⁹ To implement these approximately would require an estimated cost function.

In fact, the cost curve of the lines companies will probably reflect some balance in economies due to different output levels and different regional factors. There will be some gains in organisational efficiency to be made, and some average cost reduction due to economies of scale when distribution companies merge. The importance for yardstick competition of this analysis is that there are regional factors that matter for cost differences, and that even with a detailed study it is difficult to pin down how these affect costs. Even the market size differences across regions poses complications.

A simple way to net out regional effects would be to determine price caps on the basis of the rate of change in costs. Of itself, this approach would have to be applied to the level of costs at some date. Also, some regional effects may remain: regional business cycles may not coincide, for example.

A key basis of the justification for yardstick competition is that firms should not collude. In the extreme case of collusion yardstick competition is cost-plus pricing. Because the lines companies do not compete in the same market they have no incentive to collude: but yardstick competition provides such an incentive and information disclosure can assist. Given the large number (37) of regional businesses, co-operation would be very difficult to co-ordinate. But if significant numbers of mergers take place the ability to co-ordinate will increase. Indeed, the form of the yardstick competition itself may directly influence the rationale for mergers.

It is not clear that the criterion of regulatory commitment is met by the active threat of regulation. It is difficult to make the criteria for regulatory entry, and the consequent regulation clear and time invariant. The effect of this may be to induce firms to prepare for regulation in ways that are inimical to economic efficiency.

In sum, yardstick regulation of lines businesses is likely to require a policy on mergers, a lot of information, auditing, careful analysis of information, and bargaining with the industry. It may well be where incentive regulation leads to heavy-handed regulation.

²⁸ Incidentally, in this extreme case there would be no cost saving in mergers of distribution companies.

²⁹ Explanations of the different levels of price caps for UK electricity companies have varied to include variations due to differences in investment required for network quality upgrades, the requirement to improve revenue prospects on privatisation (Weyman-Jones (1994, 429)) and regulatory capture that varied across distribution company CEOs (Wolfram (1998)).

5. CONCLUSION

Information is critically important for the design of effective regulatory schemes. The fact that information about various relevant matters, including actions, can be hidden by individuals and organisations has led to the development of incentive regulation. These informational problems are universally present and legal and organisational institutions have evolved to cope with them. Informational issues, the structure of industries and the nature of competition are affected by the speed and direction of technological change.

It is important that regulatory, governance and ownership structures evolve that do not impede the technological change that is enabling networks to be transformed into markets. In these circumstances, there is a presumption that private providers operating in a competitive market environment and subject only to standard competition and company laws provide the optimal governance structures for network industries confronted by rapid technical change.

Light-handed regulation provides the strongest regulatory commitment, or certainty in their objective and regulatory rules, and it permits decentralised adaptation to technological change. For light- or heavy- handed regulation of private firms to perform better than State-Owned-Enterprise regulation requires some commitment to property rights. As schemes shift from heavy- to light-handed contract and competition law become much more important.

Incentive regulation can be applied under heavy- or light-handed regimes. If it is designed to force industry change, or it is based on yardstick competition it is very likely to be heavy-handed regulation.

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