Introduction to the Fundamentals of Incentive Regulation

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ABSTRACT

All forms of regulation provide incentives. Incentives, information asymmetries, and principal-agent problems all affect company performance. Cost-of-service (rate-of-return) regulation provides an opportunity to cover costs. It also provides companies with an incentive to over/under incest in plant, inflate costs, and cross-subsidize. Regulators generally try to remedy these perverse incentives though regulatory lag, sliding scales, and efficiency audits/reviews. Price cap regulation provides companies with incentives to cut costs. It also dampens the effects of cost information asymmetries between companies and regulators. Service quality and infrastructure development may suffer. Yardstick regulation promotes cost-containment, and dampens the effects of cost information asymmetries between companies and regulators. However, developing appropriate yardsticks is resource intensive. Performance-based regulation utilizes targets to incent the utility. Good performance measures should be accurately observed and verifiable, should reflect the utilities' efforts, and should be structured to reduce the impact of random variation. Franchise regulation represents another approach – where the low-price bidder becomes the supplier. Carefully designed incentive plans can result in benefits to both supplier and consumers.

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Some might argue that the term "incentive" in incentive regulation is redundant. Government intervention *by definition* establishes a system of rewards and penalties for private decision-makers. The resulting incentives can be dysfunctional, but regulation cannot help but create incentives of some type. Clearly, regulation affects behavior, as evidenced by traditional and more recent varieties of regulation. The key question is how to make the intervention productive, promoting the achievement of economic objectives at minimum cost. The purpose of this training program is to identify lessons that emerge from worldwide experience and to develop policies that build on fundamental economic principles.

Fundamentals of Incentive Regulation

Over the past two decades, economists have emphasized regulation as a response to information problems:

> Problem of monitoring performance, and
> Problem of specifying performance targets.

Incentive regulation can partly overcome information problems. Lewis and Garmon (1997) define the process as follows:

> *"Incentive regulation is the use of rewards and penalties to induce the utility to achieve desired goals where the utility is afforded some discretion in achieving goals."*

They note that there are three important elements of this definition:

> Use of rewards and penalties provide inducements to motivate the utility to perform. This system replaces a command and control form of regulation.
> Utility assists in setting goals or performance targets. Goals are not unilaterally dictated by the regulator. The firm's information on complex performance interdependencies (as between output and quality) may need to be taken into account.
> Utility decides how to achieve goals. Specific actions are not prescribed by the regulator, which allow the utility to utilize its internal information and to establish internal incentives appropriate for improved performance.

In comparing incentive regulation with control and command regulation, he notes that under the latter, the regulator provides detailed instructions of duties to be performed by the utility. For example, "the utility might be instructed to construct a particular type of power plant, to adopt select particular fuels to burn, to maintain a specified work force, and to follow specific operating procedures." Control and command sets performance goals for the utility to achieve. Command and control regulators monitor personnel to insure goals are achieved using specified procedures.

The preference for incentive regulation or control and command will depend on a number of factors:

Regulator's knowledge of utility operations
Regulator's ability to monitor utility
Administrative costs of regulation
Motives of the utility
Political environment
Capital market discipline, and
Underlying market structure.

The following generalizations emerge from the literature.

1. *Cost-of-service regulation* (including return on rate base regulation) provides an opportunity to cover costs. It also provides companies with an incentive to over/under invest in plant, inflate costs, and cross-subsidize. Regulators generally try to remedy these perverse incentives through regulatory lag, sliding scales, and efficiency audits/reviews.
2. *Price cap regulation* provides companies with incentives to cut costs. It also dampens the effects of cost information asymmetries between companies and regulators. Service quality and infrastructure development may suffer. However, incentives to over-invest in capital and to cross-subsidize are less than with cost-of-service regulation.
3. *Yardstick regulation* provides companies with incentives to cut costs. It also dampens the effects of information asymmetries between companies and regulators. However, developing appropriate yardsticks is resource intensive and may not be possible in some situations.
4. *Performance-based Regulation (PBR)* is another term applied to situations in which performance measures are used to incent the utility. Good performance measures should be accurately observed and verifiable, should reflect the utilities' efforts, and should be structured to reduce the impact of random variation. In addition, performance measures should be adjusted according to how specific or diverse are the utility's performance areas.
5. *Franchise Regulation* provides incentives for cost containment through competitive bidding for the right to provide service in a geographic area. The firm bidding the lowest price (subject to meeting quality requirements) becomes the supplier. However, re-contracting issues arise at the end of the period (e.g. capital maintenance and "lock-in" issues).

Note that hybrids of these can also be utilized.

Incentives for Cost Containment

Case studies, economic theory, and empirical evidence suggest that cost minimization is problematic under traditional U.S.-style cost-based regulation. The principal-agent/incentive literature shows the implications of firms and regulators having different information, capabilities, and objectives. Agents (corporate executives) engage in opportunistic behavior that promotes *their* objectives rather than those of the regulator. The terms organizational slack, "shirking behavior," and "engaging in abuse" are synonyms for the resource-utilizing actions of firms that cannot be monitored by regulators. Although regulators can collect information on firm expenditures, these reported accounting numbers consist of a combination of necessary production costs and other outlays that provide some benefit to managers (and perhaps stockholders).

The fundamental point of the principal-agent literature is that actual managerial abuse (or "reduced managerial effort") cannot be easily monitored (Sappington 1994). "Reduced effort" is slightly more value-neutral term, and reflects the realistic view that corporations are capable of different levels of efficiency. The achievement of best-practice can be quite costly from the standpoint of managerial effort. Whatever the behavior is labeled, it is clear that necessary costs and other outlays cannot be easily disentangled. It should be noted that in practice, regulators

punish detected inefficient behavior through cost disallowances and other regulatory penalties. In addition, yardstick regulation represents one way to benchmark firms -- rewarding good performance and penalizing poor performance. As noted earlier, care must be shown in developing appropriate comparisons. The traditional regulatory emphasis on procedural fairness in the U.S. can be shown to induce inefficiencies: when regulators cannot count what really counts, they are more comfortable following precedents!

In correspondence, Stephan King notes that nations instituting reforms face additional problems:

> A lot of regulators in Australia at present are dealing with rules that are basically new and have little if any court precedent. A significant problem at present with those reforms is that the courts have not interpreted (for example) the rules on declaration of a service. There are currently a group of appeals to the Australian Competition Tribunal over successful and unsuccessful declarations. Until the courts give some precedent and interpret the relevant statutes, the regulators are trying to operate in a rather fuzzy legislative environment. In my opinion, this tends to lead to a bias towards cost-based regulation unless otherwise
> explicitly stated in the legislation. Price cap rules have been put in place for airports but the legislation on access and for telecommunications just refers to regulatory criteria such as "...the legitimate interest of the owners ...". In the latter case, it is easiest to interpret "legitimate interest" by using rate-of-return rules.

Thus, lack of precedents can lead to delays and/or regulatory inertia.

In addition, regulatory commissioners can have their own agendas. Regulators can also engage in “opportunistic behavior” – related to future income opportunities or to political aspirations beyond current responsibilities. Just as firms have access to unique information, agencies obtain confidential data from a wide range of entities. Such information can be misused or deliberately misinterpreted to the personal advantage of the regulator. The “public interest” theory of regulation takes a different view of the process: policy makers and politicians are basically benevolent designers of government institutions which correct market failures and reduce market imperfections. Economic theories of regulation introduce a greater role for special interests, including the interests of regulators themselves.

Incentives issues arise whichever view of regulation one takes. Traditional cost-based regulation in the U.S. involved a bottom-up approach: costs were aggregated and service prices reflected the results of complex (and arbitrary) cost allocations. Postage-stamp pricing resulted within a utility's territory with customers in high cost rural areas and low cost urban areas paying the same prices. The political advantages of such regulatory treatment made for a stable situation. The beneficiaries of the rules were well aware of their gains, and the costs were spread over a larger population. Politicians also argued that income distributional concerns or universal service obligations justified the higher prices borne by some customers. For example, in telecommunications, since local telephone rates were held down due to transfers from long distance customers, the cross-subsidies came at the expense of "others". The political economy of rate design raises numerous issues. For example, initial asset valuation becomes a key issues at the time of price cap review - - since it affects allowed profits. For now, we focus on the recent movement away from cost-based regulation to price-based regulation, generally involving some form of price caps, often with profit-sharing between stockholders and customers. The U.K pioneered in the introduction of price caps (Beesley and Littlechild, 1989; Weyman-Jones, 1990).

The purpose of these regulatory policy changes has been to avoid the inefficiencies associated with cost of service regulation (Braeutigam and Panzar, 1989). These inefficiencies have been identified as the AJ effect (overcapitalization which leads to production and allocative inefficiencies), cross-subsidization (entering competitive markets and recovering costs from core customers), excessive or inadequate service quality, and employee/managerial slack. The extent of these inefficiencies is an empirical question, although studies of the

impacts of competitive pressures and "incentive" regulation suggest that the inefficiencies associated with traditional regulation were significant. However, it is hard to distinguish between the competition effect and the regulation effect, since reductions in entry barriers and incentive regulation often occur simultaneously. Perhaps competitive pressures should be given more credit for the productivity advances and new service introductions arising in recent years.

As noted earlier, information asymmetries create problems: firms have information and opportunities which enable them to benefit at the expense of ratepayers. Agencies incur administrative costs to deal with these issues. In 1988, the direct cost of operating regulatory agencies in the U.S. amounted to about $.50/month per household--a trivial sum for oversight activity in comparison to the amount consumers spent on electricity, telecommunications, and other infrastructure services. In the U.S., some argue that additional regulatory monitoring activity and longer regulatory lags between rate reviews can promote efficient production; others see opportunities for reductions in regulatory oversight (as agencies move toward more “light-handed” intervention).

New types of regulation may still fall short of potential gains from improved incentive mechanisms. Within the U.S., the state telecommunications plans adopted in California, Illinois, Michigan, and elsewhere tend to have a range over which cost reductions do not lead to price reductions, so profits are earned on a dollar for dollar basis. Usually, sharing sets in at some point (say, at a particular realized rate of return), and beyond some return, all of the savings are passed on to customers (in the form of lower prices or rebates in a future period). The Washington plan has one especially interesting feature: the firm captures an increasing share of the profits -- so the disincentives associated with a profit cap are avoided. However, according to Blackmon (1994), other features of that particular incentive plan are problematic: excessive rewards to small increases in efficiency and inadequate rewards for larger improvements, distorted risk-taking (depending on whether one is at the top or bottom of the sharing scheme), and intemporal manipulation of outlays--so the bunching of expenses can increase profits.

As will be seen, both giving firms an option regarding price caps and instituting sharing rules have some desirable features. Firms can have input on setting performance objectives, but regulators should recognize that firms have an incentive to understate their abilities to reduce costs. With a policy of creating options, the regulator establishes several plans, with different productivity (`X') factors. Low performance targets (prices that fall more slowly) are linked to lower rewards, with high performance targets having sharing rules that yield higher (possibly unlimited) profit potential for the firm. Such optional schemes induce firms with substantial potential for cost containment to self-select into the appropriate plan. The FCC price caps applied to local exchange carrier access charges had this feature. This scheme has some excellent incentive properties and builds upon insights from the principal-agent literature.

Incentive plans in infrastructure industries are quite complicated. Academic researchers often use highly stylized characterizations of regulation to allow us to highlight the strengths and limitations of alternative regimes and sharing rules. However, the buy-ins (initial prices, plant modernization mandates, and plan durations) accompanying the actual incentive plans are important aspects of transitional deregulation. Nevertheless, it is easy to demonstrate the deficiencies of the bottom-up cost-plus approach. Regulatory micromanagement cannot induce efficient production. A top-down "price caps and sharing rules" approach represents an improvement over cost-based regulations -- though problems still exist (Weisman, 1994).

There is some evidence that the transition to more competitive markets has often involved new types of regulation rather than less regulation in the evolution to new industry structures. Numerous contentious issues are still being fought in hearing rooms in the U.S. and debated around the world: funding universal service, maintaining network interoperability, ensuring service quality, developing number portability, continuing supplier of last resort obligations, determining the appropriate extent of unbundling, establishing interconnection charges, and designing

efficient prices for network components. In telecommunications, the convergence of voice, data, information services and video markets raise numerous issues regarding entry, service quality and interconnection. Spectrum, fiber optics, and other technologies make it difficult to predict optimal configurations of firms in an industry. These issues warrant attention as they illustrate the complex problems facing policy-makers. In particular, entry policy represents a potential substitute for price and profit regulation. The competitive route to disciplining market power is being followed in many countries -- with respect to electricity generation, natural gas, and telecommunications.

Guidelines and Principles

There is no simple and comprehensive roadmap for policymakers in this decade of dramatic change. Rough maps of relatively unexplored territory are bound to contain errors and omissions. Mistakes will be made--some turns to the left or right will lead to dead-ends. Then politicians will have to retrace their steps or strike out over uncharted territory. The regulatory lessons from the U.S. suggest that the politics and economics of infrastructure industries are complex. The best decisions are those which are based on reality. However, incumbents, potential entrants, and consumers have difference views of technological realities. From the standpoint of public policy, that which seems familiar is not necessarily appropriate in new territory.

The central message of this overview has been the need to design institutions which promote efficiency. The U.S. is slowly abandoning rate of return on rate base regulation, though it sometimes seems like two steps forward and one step back. The competitive forces unleashed by new technologies, court rulings, and new legislation can be channeled but not totally diverted. Entrants become stakeholders, and while they too attempt to manipulate the political system to their advantage, incumbent suppliers will not depart the field of battle without a fight. If the incentives are such that least cost suppliers win markets and those who introduce valued new services obtain profits, then the economy as a whole is the winner.

We have learned some principles that can be useful in new situations. However, in some instances, the art of policy development requires compromise. Pricing of access to essential facilities is probably the toughest issue confronting regulators in the U.S. and elsewhere. Arrangements have emerged in some state jurisdictions, based on a blend of economic principles or political compromise. Other principles have been enunciated for the regulatory transition in energy and telecommunications. In his survey of incentive regulation, Sappington (1994) identified ten guidelines for designing incentive regulation plans:

1. Use incentive regulation to better employ the firm's superior information.

2. Prioritize regulatory goals and design incentive regulation to achieve stated goals.

3. Link the firm's compensation to sensitive measures of its unobserved activities.

4. Avoid basing the firm's compensation on performance measures with excessive variability.

5. Limit the firm's financial responsibility for factors beyond its control.

6. Adopt broad-based performance measures where possible, unless their variability is excessive.

7. Choose exogenous performance benchmarks.

8. Allow the firm to choose among regulatory options, while recognizing the interdependencies among the regulatory options that are offered to the firm.

9. Promise only what can be delivered, and deliver whatever is promised.

10. Plan for the rare, unforeseen event, but minimize after-the-fact adjustments to the announced regulatory policy.

As Sappington points out, " . . . the design of sound, effective regulation in particular settings will require careful attention to the idiosyncratic features of the environment. The best incentive regulation plan in any given setting will vary according to regulatory goals, institutional and technological factors, the nature of the information asymmetry between regulatory and firm, and the commitment abilities of the regulator." (p. 269)

Performance-based incentive mechanisms are emerging in state regulatory jurisdictions; these new initiatives include price caps, revenue caps, yardstick regulation, and profit sharing. Some of these alternative rate plans have emerged as a result of a collaborative process involving the participation of major stakeholders. The design issues (such as those noted earlier in conjunction with price caps) require the resolution of a set of interrelated problems. Attention to fundamental economic principles has strengthened new regulatory initiatives.

Some read the history of regulation, and conclude that new initiatives are *not* called for. Shepherd (1992) states, "The 1980s search for a mechanical, automatic method of 'incentive regulation' was largely illusory. In complex situations, there is no easy substitute for sophisticated, effective regulation." (p. 71) In contrast to Shepherd, Strasser and Kohler (1989) describe the overlapping command and control mechanisms comprising cost of service regulation as tools which are " . . . at best blunt and crude, preventing the worst abuses, but not sharp enough to encourage anything better. An incentive approach promises more." (p. 137) Later, they state, "Controls can keep managers from doing specific things, but they cannot command managers to use management processes energetically and creatively to tackle the problem of more efficient operation, although improved processes are essential to improved performance." (p. 169) Movements away from cost-of-service regulation are illustrated by profit sharing via banded returns and various forms of incentive regulation. Generalized incentive regulation could be characterized as decoupling prices from costs via new regimes, such as yardstick regulation or price caps. As regulators move away from command and control micromanagement, they are lowering entry barriers and utilizing incentive regulation in those markets with residual market power.

In summary, note that making firms more profit-driven (reducing incentives for "abusive behavior") can be a win-win situation, although some customers might be worse off under price caps and sharing rules. For example, firms may be less tolerant of non-paying (generally, low income) customers and their willingness to promote environmental investments may be reduced. Electricity demand-side management programs also suffer to the extent that they tend to decrease net case flows to the firm. Many observers would conclude that these perceived negatives do not outweigh the efficiency gains from adopting carefully-designed incentive regulation. Going beyond existing plans, some industry researchers (such as Blackmon) would provide the utility with 100% of changes in profits (on the margin) so that incentives are not capped (as with many state plans). To address the regulatory commitment problem, he proposes that plans be established for a fixed time period, with regulators deciding halfway through a plan whether it should be rolled over for another term. Whether the accompanying rate freeze sufficiently promotes allocative efficiency is another question. Finally, when price cap regimes have been implemented, the review processes resemble rate of return regulation – strong efficiency incentives end up being balanced against consumer calls for sharing in the cost savings.

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