

Principles of Regulatory Policy Design

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1. Introduction.

Regulatory policies differ in many ways. They affect different individuals and firms, they influence different aspects of behavior, they alter conduct and behavior to varying degrees, and they employ different methods of oversight and control. These differences are seldom arbitrary. The purpose of this paper is to trace differences in regulatory policies to differences in: (1) the objectives and resources of the regulator; (2) the institutions of the jurisdiction in which regulation is imposed; and (3) the characteristics of the industry for which regulation is contemplated. Each of these factors will be shown to influence the distinguishing features of regulatory policy in important ways.

To delineate more precisely the key dimensions along which regulatory policies differ, a form, function, and scope trichotomy will be employed throughout the ensuing discussion. The form of regulation encompasses the procedures employed to design and enforce regulatory rules, the nature of these rules, and the locus of decision-making authority in the regulatory arena, e.g., whether the regulator makes and enforces all relevant decisions, or whether considerable decision-making authority is delegated to the regulated entities. The function of regulation refers to its basic purpose. For instance, some regulations are designed to ensure safety, others to secure production at minimum cost, and still others to provide information to consumers. The scope of regulation refers to the extent of regulatory oversight and control. Regulation can be all-encompassing, imposing strict rules on all relevant activities. Alternatively, regulation can merely suggest guidelines for a small subset of relevant activities.

To reiterate, this paper will focus on explaining how differences in regulatory objectives and resources, social institutions, and industry characteristics influence the form, function, and scope of regulatory policy.

It is important to note at the outset the great variety of regulations that is observed in practice. Price, quality, information disclosure, and compatibility regulations are common examples. Price regulation often places an upper bound on the price of a product. Quality regulation can entail the specification of a minimum level of quality that must be achieved. Regulation of information disclosure can require producers to accurately describe the key features of their products. Compatibility regulation can require manufacturers of similar or complementary products (e.g., computer hardware and software) to design their products so that consumers can easily substitute the product of one manufacturer for that of another manufacturer when assembling a good (like a computer system) that has multiple component parts.

The variety of regulations arises in part from the many different functions or purposes of regulation. In some instances, product safety is paramount (e.g., the purity of food products), while in other instances, product price is the central concern (e.g., the amount consumers pay for basic telephone service). Even when regulations have the same purpose, though, their forms can differ. To illustrate, the methods employed to ensure reasonable but not exorbitant financial returns to producers of commodities like electricity and telecommunications services differ across countries and across jurisdictions within some countries. Rate of return regulation with little or no pricing flexibility is a common form of regulation. It generally involves setting prices for all of a firm's products to generate a predetermined return on investment for the producer. Price cap regulation is another form of regulation that is gaining popularity. Under price cap regulation, the prices charged by the regulated firm for its services must not exceed a prespecified level *on average*, but the firm has significant freedom to set individual prices.

The explanation of differences among regulatory policies begins in section 2 with a more

complete description of the form, function, and scope of regulation. The three key factors that underlie differences in regulatory form, function, and scope are then analyzed in sections 3 through 5. Concluding thoughts are offered in section 6.

Before proceeding, some caveats are in order. First, space and time constraints preclude a complete explanation of all relevant differences in regulatory policy across all jurisdictions. Only some of the key determinants of certain aspects of regulatory policy will be discussed. Thoughts on relevant considerations that receive insufficient attention here are presented in section 6. Second, while there are a great variety of settings in which regulators interact with regulatees, all such settings are not analyzed in detail here. For the most part, attention is restricted to the common setting in which "the regulator" is a government official (or body of officials) charged with establishing rules to govern economic activities in one sector of society. The classic example is one where the regulator is a public utility commission that sets rules which govern the operation of a regulated firm, such as a producer of electricity or telecommunications services.

Finally, this research is not intended as a summary of the economic literature on regulation. While some references to the literature are provided, the references are not systematic, and they are relatively few in number. The main purpose of this paper is to provide one perspective policymakers might find helpful when deciding whether regulation is appropriate for the environment in which they operate, and, if so, what form of regulation is most appropriate.

2. Differences Among Regulatory Regimes.

The purpose of this section is simply to describe in more detail the three key dimensions

in which regulatory policies differ: form, function, and scope. The discussion begins with the form of regulatory policy.

A. Regulatory Form: Centralized versus Delegated Decision-Making.

As illustrated in the introduction, common regulations have many different characteristics. Some set limits on the price that can be charged for a product while others set minimum quality or compatibility standards. These different aspects of regulatory form are intimately linked to differences in regulatory goals and objectives, which are analyzed in section 4. To briefly foreshadow the discussion in section 4, consider a setting where the regulator's primary goal is to assure that a high-quality product is delivered to consumers. In such a setting, regulations that are imposed will likely specify a minimum quality level that must be achieved. Thus, the form of regulatory policy often follows directly from regulatory goals.

A more subtle aspect of the form regulations take is the extent to which decision-making is delegated. *Command-and-control* regulation represents one extreme on this dimension. Under command-and-control regulation, the regulator dictates in great detail the actions the regulated firm must undertake. For instance, in a setting where water purification and delivery are regulated, the regulator might dictate the exact details of the purification process, the rate at which water is purified, the type of pump and conduit used in water delivery, and the exact price at which water is sold to all customers. Similarly, in regulating the provision of taxi service in a large city, the regulator might dictate the number and type of vehicles an authorized supplier of taxi service must own, the number of taxis that must be on the road at each moment in time, each vehicle's service and repair requirements, the type of dispatch system that must be employed, the qualifications of drivers, and the price of taxi service.

In contrast to such command-and-control regulation, the regulator may delegate considerable discretion to the regulated firm. To illustrate, consider again the setting where water purification and delivery are regulated. The regulator who merely states the level of purity delivered water must achieve and the price at which water must be delivered delegates considerable discretion to the regulated firm. The firm is free to choose the purification process it prefers and the delivery system it finds to be most effective. Similarly, if the regulator of taxi service only specifies that quick, courteous and safe transportation must be provided at a specified price, the taxi company is left with considerable discretion regarding its method of operation. The company can decide which types of vehicles to purchase (or lease), how often to service and repair the vehicles, how many drivers to hire, the necessary training and qualifications of drivers, and the method of dispatching taxis.

In many instances, *incentive regulation* involves delegating decision-making to the regulated firm. Goals or targets are usually set under incentive regulation, and the firm is rewarded according to how its realized performance compares with the established targets. When the firm's final performance is monitored but its exact method of operation is not dictated, decision-making authority is delegated to the firm. One form of incentive regulation that has gained popularity in the telecommunications industries of Great Britain and the United States in recent years is price cap regulation. Under (pure) price cap regulation, the average price level at which the firm sells its services is restricted, but the firm has considerable latitude in setting individual prices and in determining how to provide services at minimum cost.

Other forms of regulation also delegate considerable discretion to the regulated firm. *Potential regulation* is an example. Potential regulation refers to a regime in which no

restrictions are placed on a firm's activities unless the firm's performance is judged to be unsatisfactory according to some prespecified criterion. To illustrate, a regulator may allow a firm to provide services and set prices in any way it sees fit, provided the firm's customers are satisfied with the services they receive. However, if a sufficient number of customers complain and ask for regulatory intervention, the regulator will investigate the reported dissatisfaction, and force the firm to remedy any problems that are discovered.¹ In such a setting, the primary monitors of a firm's performance are its customers. If the firm can satisfy these monitors, it can avoid direct regulatory scrutiny and control.

Considerable discretion is also awarded to the regulated firm when the regulator conducts *reactive* rather than *proactive* policy. Under reactive policy, the regulated firm first proposes or undertakes an action, and the regulator subsequently approves or disapproves of the action. In contrast, under proactive regulatory policy, the regulator states in advance which actions will be approved, and which actions will not be permitted. To illustrate, a reactive regulatory policy would be one in which a regulator reserves the right to approve or disapprove of new drugs, but places no restrictions on the types of drugs a firm can research and manufacture *ex ante*. A proactive regulatory policy would restrict the type of research the firm could conduct and/or would state in advance that drugs with certain characteristics (e.g., drugs that induce abortions) will not be approved.

Decision-making authority is not the only authority that can be delegated to regulated firms: rule-making authority can be similarly delegated. Many professions set standards for their members. For instance, medical associations regularly specify licensing requirements for their members, determine which training institutions are accredited, and discipline members who

violate the rules or ethics of the association. In such instances, the primary (potential) regulator (e.g., the government) authorizes a substitute regulator to set rules and regulations, rather than doing so directly.

One final aspect of regulatory form is the manner in which rules are designed and enforced. Policy design can proceed behind closed doors or in open public hearings. It can also be influenced by formal or informal communication between the regulator and the firm. The regulator may monitor the firm's performance and verify directly that regulatory edicts are being followed. Alternatively, the customers of the regulated firm may be called upon to monitor the firm's performance (as under potential regulation, for example).

B. Regulatory Function: Informing versus Enforcing Regulation.

Function is a second dimension on which regulatory policies differ. There are many ways in which the function or purpose of regulation can differ. For instance, the primary purpose of a regulation can be to protect consumers from unsafe products, or to ensure that all customers are treated in similar fashion. Regulations can also be designed primarily to limit the profits of a monopoly producer, or to control various aspects of the interactions among producers. Like regulatory form, regulatory function is often intimately linked to the goals and objectives of the regulator. This link is described in more detail in section 4.

One element of regulatory function that will receive particular attention in the ensuing discussion is the extent to which regulations serve to inform consumers about the regulated firm's activities, rather than dictate which activities will be allowed. A primary example of *informing* regulation is the requirement that manufacturers of food products list all the ingredients contained in their products. In contrast, *enforcing* regulation in the food industry

might involve prohibitions against the use of certain chemicals in foods. A second example of the difference between informing and enforcing regulation can be taken from the computer industry. Informing regulation might simply require each manufacturer to specify the interfacing capability of its products, and to list the products of rival producers with which the manufacturer's product is compatible. Enforcing regulation, in contrast, might impose industry-wide compatibility standards, requiring all manufacturers to adopt standard interface capabilities.

The key distinction between informing and enforcing regulation is the discretion afforded consumers. Informing regulation enables consumers to make well-informed choices. Enforcing regulation makes choices for consumers. As will be explained shortly, the choice between informing and enforcing regulation depends in part on the relative costs of acquiring and processing information for the regulator and for consumers.

C. Regulatory Scope: Comprehensive versus Partial Regulation.

Regulatory scope is a third dimension on which regulatory policies differ. The scope of regulation can be viewed as the extent to which regulation is comprehensive, i.e., the extent to which it encompasses all of the regulated firm's activities. In some industries, like telecommunications, comprehensive regulation is common. The regulator generally controls the prices charged by the telecommunications provider, limits the firm's earnings, monitors the quality of the firm's products, oversees the firm's major investments, and dictates the markets in which the firm is allowed to operate. In other industries, like pharmaceuticals, regulation is often more partial, and less comprehensive. The safety of drugs is often regulated, but drug prices are not usually regulated, and neither are the earnings of pharmaceutical companies.

In settings with multiple suppliers of a product, the scope of regulatory control can also

vary according to the number of suppliers that are regulated, and the extent to which they are regulated. In some industries like telecommunications and electric power generation, all aspects of the operations of large (dominant) firms are often regulated, while similar activities of smaller firms are either not regulated at all, or are regulated less stringently. For instance, in the United States, the prices charged by AT&T for telecommunications services are regulated by the Federal Communications Commission. In contrast, the prices charged by its main competitors (MCI and Sprint) are not regulated.

Having identified some of the key dimensions in which regulatory policies differ, it remains to explain why regulation differs along these dimensions. Three key explanatory factors are described in detail in the next three sections.

3. The Regulator's Objectives and Resources.

The purpose of this section is to explain how the objectives of a regulator and the resources at his (or her) disposal influence the type of regulatory policy that is likely to be implemented.

A. Regulator's Objectives.

To begin, consider how the regulator's objectives influence the design of regulatory policy. Regulatory goals and objectives can vary widely, and often have direct bearing on regulatory policy. The ensuing discussion cites six common goals and explains their implications for regulatory policy.

A1. Foster Industry Development and Investment.

A common goal of regulators is to foster development of the industry they regulate.²

Often, regulated industries are central to the development of other industries. For instance, a modern, full-service telecommunications system is crucial to the successful operation of the financial sector of a country. There are many ways a regulator can foster industry development. For example, using command-and-control regulation, the regulator can mandate the adoption of operating equipment and techniques (e.g., nuclear power plants or fiber-optic telephone cable) that have proved successful elsewhere. Alternatively, the regulator might delegate the choice of technology to the regulated firm, but promise substantial returns for any new investment in the industry that improves industry performance.³

A2. Ensure Safe, High-Quality Service.

Safety is of paramount concern in some industries. When electricity is generated by nuclear power, for example, it is critical that the generation process proceed safely. High-quality service is also important in many settings. For instance, it is important that the water supplied in municipal water systems be purified completely. Safety and high-quality service can be promoted through command-and-control regulation if the regulator dictates operation and performance standards and enforces these standards. Alternatively, the regulator might only set targets for product quality and operational safety, and penalize or reward the regulated firm according to how its realized performance compares to the established targets.

A3. Promote Least-Cost Production.

To provide service to customers at reasonable prices, a regulator will commonly strive to ensure that production occurs as cheaply as possible. Least-cost production can be fostered by careful scrutiny of the operations and financial records of the regulated firm and/or by

providing financial incentives for the firm to reduce operating costs. For instance, price cap regulation can provide strong incentives for least-cost production. Under price-cap regulation, the prices a firm is allowed to charge for its products are not tied to realized production costs. Consequently, if the firm succeeds at reducing its operating costs, it is not required to pass all of the cost savings on to consumers in the form of lower prices. Such a policy can provide strong incentives for least-cost production.

A4. Achieve Desired Consumption Levels.

Regulatory policy can influence which parties consume regulated products, and how much they consume. Prices can influence consumption, as can regulatory mandates to consume or to refrain from consuming a product. Information provided by the regulator or by the firm at the regulator's insistence can also influence consumption levels. Sometimes, a regulator may wish to increase consumption of a commodity, like vaccines against communicable diseases, or public (as opposed to private) transportation. In other instances, a regulator may prefer that consumption of products like addictive drugs, pornography, or ozone-depleting chemicals be reduced. Different regulatory policies can be employed to promote these varied goals.

A5. Promote More Equitable Outcomes.

Redistribution of income can also be a goal of regulators. To illustrate, there has been a conscious policy in many countries to subsidize local telephone service with revenues from long-distance telephone service. Similarly, business customers are often charged more than residential customers for similar telephone service. One reason for these policies is to effectively redistribute income from individuals with greater wealth (e.g., owners of business

enterprises and citizens who can afford to make long-distance telephone calls) to individuals with less wealth.

A6. Limit the Earnings of Producers.

Redistribution of income from producers to consumers of regulated products is another common regulatory goal. In industries where technological considerations (i.e., economies of scale) render production by a single producer most economical, a key charge of regulators is often to limit the abuse of monopoly power by the single regulated producer. To limit the exercise of monopoly power, a regulator will generally force prices below the levels an unregulated monopolist would charge.

Each of these six goals and objectives has obvious implications for the form, function, and scope of regulatory policy. Some of these implications have already been cited. Important complications can arise, though, when the regulator pursues more than one of these goals simultaneously. To illustrate, suppose the regulator wishes to limit the earnings of the regulated producer while fostering investment in the regulated industry. The two goals can conflict, since attractive financial returns must be promised if private investors are to be induced to invest in the regulated industry. As an additional illustration, the goals of quality enhancement and cost minimization can also conflict. Often, higher quality service is more costly to provide, so the regulator may have to implement a compromise between high quality and low cost.

The exact compromise that will result when regulatory goals conflict will depend on the relative importance of the conflicting goals. For instance, when technological progress and infrastructure development in an industry (like telecommunications) is considered paramount,

and when the pressure to limit the earnings of the regulated firm is not great, the regulator will be inclined to permit substantial returns on new investment.

A key determinant of the relative importance of regulatory goals is the likely consequences of failing to achieve the various goals. If the failure to meet a particular goal would have a substantial, obvious, immediate, and adverse impact, the regulator will likely give that goal a high priority. For instance, if a malfunction at a nuclear power plant would have a widespread negative impact on society, a regulator might be willing to incur great expense to ensure safe operation of the nuclear plant, even though doing so would result in higher prices for electricity.

Observed regulatory policy will also vary over time as different levels of success at achieving various goals are realized. This is the case even if regulatory goals do not change over time. To illustrate, suppose it is considered very important both to ensure the provision of high-quality service and to promote least-cost production. Initially the regulator might focus on the former objective, and subsidize investment and research and development to enhance product quality, even though doing so initially results in higher operating costs. Once reasonable quality levels are achieved, the regulator might redirect attention toward reducing production costs, perhaps by implementing a form of regulation (like price cap regulation) that can provide strong incentives for cost reduction. This sequential approach to meeting multiple objectives can be particularly effective when progress in achieving the first goal (e.g., establishing a modern telecommunications network) enhances progress in achieving subsequent goals (e.g., improving the operations of the financial sector of the economy).⁴

B. Regulator's Resources.

Now consider how the resources available to the regulator can influence regulatory policy. Relevant resources include the size, the educational training, and the experience of the regulatory staff. A large, well-trained, and experienced staff can enable regulators to research and better understand the environment in which they operate. Detailed information about current operating technologies, potential alternative technologies, and consumer preferences is often required to design effective regulatory policy. Substantial information about the performance of the regulated firm (e.g., realized earnings, product quality, and customer satisfaction) is also required in many settings to implement and enforce regulatory policy.

Limited information about the regulated industry can influence the form, function, and scope of the regulator's operations. In particular, when the regulator's information is limited, command-and-control regulation may be inferior to regulation in which substantial decision-making authority is delegated to the (better-informed) regulated firm. Furthermore, the regulator may achieve his goals more effectively if he allows market forces, rather than regulatory mandate, to govern some dimensions of the firm's operations. To illustrate, consider an industry characterized by rapid technological change, frequent development of new products, and rapidly changing needs of customers. In such an industry (perhaps like the telecommunications industry), it will be difficult for a regulator to determine the least-cost means of operation and the most desired array of products, particularly if the regulator's support staff is limited in numbers and training. Consequently, any attempt by the regulator to micro-manage the firm's production techniques, its product offerings, and its pricing decisions through command-and-control regulation may result in substantially lower performance than what could be achieved

with complete information about the firm's operations.

To reap some of the benefits that would be available if the regulator had access to critical information, the regulator can often employ the superior information of the regulated firm. He can do so by delegating some decision-making authority to the firm. To illustrate, the regulator might grant the firm considerable pricing flexibility on new services, provided the firm makes all of the services it currently offers available to customers at existing prices. Such a policy ensures the range of consumption opportunities available to customers is not reduced, and may be increased.⁵ Subject to maintaining current product offering, the regulated firm can employ its superior information to determine which products will best serve customers' needs while providing additional net revenues for the firm. In a setting where the regulated firm faces competition on some services, the pricing flexibility afforded the firm can also enable the firm to better cope with competitive pressures.

As another illustration, a regulator with limited knowledge of the firm's capabilities can allow the firm to use its superior information to choose among compensation arrangements. For instance, suppose the regulator is uncertain of the firm's ability to reduce its production costs and, without jeopardizing its financial integrity, lower the prices it charges for its products. If the regulator guesses incorrectly that the firm's ability is high and instructs the firm to implement large price reductions, the financial viability of the firm may be threatened. The result may be a costly interruption of high-quality service to customers (perhaps because the firm is forced to declare bankruptcy). On the other hand, if the regulator adopts the safe strategy of enforcing only the small price reductions that the firm can provide even when its ability is low, potential gains for consumers in the regulated industry may be foregone.

To ensure greater gains for consumers where they are possible while avoiding financial distress for the regulated firm, the regulator can offer the firm a choice between two compensation arrangements. The first would require only minor price reductions, but would restrict the ability of the firm to earn large profits. The second arrangement would require more substantial price reductions, but would also allow the firm to retain more of the profits it generates from reducing production costs. A pair of compensation arrangements that is carefully designed along these lines can induce the regulated firm to implement larger price reductions when its ability to do so is high, and effect smaller price reductions when its ability is low. The firm will earn higher profits when its ability is high, but the firm's customers will also benefit from the more substantial price reductions that are implemented when the firm's ability is high.⁶ Thus, through well designed delegation of price-setting authority to the party with superior information, the firm's performance can be better matched to its ability, and all parties can be made better off.⁷

In summary, both the regulator's goals and the resources at his disposal can have important impacts on the form, function, and scope of regulatory policy. Limited resources can result in a paucity of information being available to the regulator. Consequently, the regulator may be compelled to delegate decision-making to the regulated firm, inducing the firm to use its superior information to further regulatory goals to the extent possible. Limited resources and information can also limit the scope of activities the regulator can reasonably oversee. Specific, targeted regulatory goals and objectives also render more appropriate a limited scope of regulatory control.⁸ The nature of regulatory goals (e.g., whether the regulator wishes simply to inform consumers or to enforce particular income distributions) can also have a direct impact

on the function of regulation, and the form it takes.

4. Institutional Structure.

The purpose of this section is to explain how the institutional structure of the environment in which the regulator operates can influence the design of regulatory policy. Two aspects of institutional structure are emphasized: the ability of the regulator to fulfil his promises; and the set of complementary control instruments that are in force in the environment.

A. Regulator's Commitment Powers.

Regulatory policy can only be effective if it influences the activities of the regulated firm. To influence the firm's activities, regulatory policy must create systematic links between the firm's activities and its financial well-being. For instance, if regulatory policy is to ensure high-quality services, the regulated firm must expect to suffer financially if it produces low-quality services. To influence the firm's activities, regulatory policy must do more than threaten financial penalties for undesired behavior or performance and promise financial rewards for desired behavior or performance. Regulatory threats and promises must actually be carried out as stated if they are to influence the firm's activities.

To illustrate, suppose the regulator promises the regulated firm a higher profit level if it streamlines its operations and thereby achieves substantial cost reductions. Such a promise will only induce the firm to reduce costs if the promise is credible. If the regulatory environment is such that consumers or other government officials will protest vehemently when the firm's profits increase above some normal level and force the regulator to rescind the promised increase, announced promises will not induce the desired behavior from the firm.

Anticipating that the regulator will ultimately be unable to fulfil his promises, the firm will not act on the initial promise. Similarly, suppose the regulator threatens severe penalties should the firm's operating procedures ever be found unsafe. Also suppose, though, that the regulator always gives the firm one more chance to improve its operations when safety violations are detected, to be sure the firm's financial integrity is not jeopardized by the threatened penalties. In such a setting, the announced regulatory policy should not be expected to induce the regulated firm to improve the safety of its operating procedures.

The ability of a regulator to fulfil the promises he makes is often referred to as the regulator's *commitment ability*. A regulator's commitment ability is determined by a variety of factors. The political pressures a regulator faces is one important factor. If a regulator can easily be replaced on short notice by his superiors (e.g., leaders of the executive or legislative branch of government), it may be difficult for the regulator to promise to pursue a policy that differs from the preferred policy of his superiors. For instance, although the regulator might threaten to expose the incumbent producer to competition if the incumbent's performance is judged to be inadequate, the regulator may face great difficulty in allowing new entrants into the marketplace if the country's governing bodies strongly oppose competition.

Similarly, if the regulator is elected directly by citizens at frequent intervals, he may be hard pressed to implement policies that appear contrary to the immediate interests of consumers. For instance, the regulator may have difficulty switching to a new technology (like nuclear power generation) that involves large initial investments and substantial price increases for customers, even though operating costs in the distant future will be lowered sufficiently to more than offset the higher initial costs. If consumers are myopic and have direct control over the

regulator's tenure, the regulator may have to adopt a myopic outlook himself if he wishes to retain his position.

A regulator's commitment ability is also affected by the strength and independence of the judicial branch of government. A strong, independent judiciary can uphold and support regulatory decisions that are in the best interest of society, even though they may be unpopular with consumers or legislative leaders.⁹ To illustrate, consider again the setting where many of a country's legislators are firmly opposed to allowing competition in the regulated industry, even though competition is not explicitly forbidden under existing law. Also suppose the judiciary functions as an independent body, and its rulings are respected and upheld. Then if the regulator is elected or appointed for a reasonably long period of time in this setting, he may be able to introduce competition into the regulated industry. On the other hand, if judicial rulings are ignored or if the judiciary serves only to enforce the whims of the legislative or executive branches of government, then the regulator may find no allies in his quest for competition, and so his efforts may be futile.

The usual practices and overall stability of the government can also influence a regulator's commitment ability. Consider a setting where the regulator wishes to convince private investors to provide the funds necessary to modernize the production facilities of the regulated firm. Investors must anticipate lucrative returns if they are to provide the requisite funds. Such returns will not be anticipated despite regulatory promises, though, if the government is prone to nationalize successful private operations or otherwise expropriate large returns that result from private investment. And even if the government presently in power has no history of expropriation, when the stability of the government is in doubt because of strong

pressure from an opposing government that is known to favor expropriation, investors will be unlikely to believe regulatory promises of large financial returns. Consequently, it may be impossible for the regulator to attract the investment he seeks.

Thus, limited commitment ability can undermine the success of regulatory policy. It can also affect the form, function, and scope of the regulatory policy that is undertaken. For instance, a regulator with limited commitment ability may not solicit construction funds from private investors at all. Any construction that is undertaken may be financed entirely by the government. Similarly, if the regulator cannot credibly promise either to deliver large returns to the regulated firm for outstanding performance or to impose large penalties on the firm for poor performance, the regulator may not develop far-reaching incentive programs in an attempt to influence the firm's behavior. Instead, the regulator may attempt to scrutinize and control directly the limited number of the firm's activities that he can monitor, and allow the firm considerable latitude on other activities. Alternatively, the regulator may adopt more of an informing role than an enforcing role, simply providing information to consumers about the firm's activities and its products, and relying on consumers (and perhaps competitors) to discipline the regulated firm. In extreme cases, where limited commitment ability renders hollow any promises or threats made by the regulator, there is little reason to formulate regulatory policy at all. Hence, the scope of regulation can be restricted severely by limited commitment ability.

To this point, the commitment ability of the regulator has been treated as an exogenous variable. In practice, it is often endogenous to some extent. For instance, recall that it may be difficult for a regulator to solicit funds from private investors because of the threat of

government expropriation. This threat can be reduced through careful choice of technology and institutional structure. To illustrate, consider the telecommunications industry. Even though long distance telephone service may be provided most inexpensively by laying subterranean fiber-optic cables, it may be preferable to provide the service using satellites. Because satellites are readily redeployed for alternative uses, a threat of government expropriation can be reduced by the credible counter-threat of refusing to use the satellites to provide long distance telephone service if the government engages in expropriation.

A threat of government expropriation or nationalization can also be limited by providing many citizens with a sizeable stake in the profitable operation of the regulated firm. For instance, if ownership shares in the regulated firm are widely dispersed, many citizens will be upset and will lobby the government to change policy if any attempt is made to nationalize the regulated firm or unduly restrict its profits. Thus, a widespread distribution of ownership shares can create a natural constituency for the ongoing success of the regulated firm, thereby adding credibility to claims that private investment in the firm will not be expropriated.¹⁰

A regulator's commitment powers can also be enhanced directly. If a regulator is appointed to a relatively long term rather than elected directly by citizens for a short period of time, the regulator will be insulated to some degree from direct consumer pressure. Similarly, if regulatory appointments are based on training, experience, and credentials rather than party affiliation or political views, an environment of greater autonomy for regulators may be fostered.

B. Complementary Control Instruments.

An additional aspect of a country's institutional structure that affects the design of regulatory policy is the set of complementary control instruments that is in place. The set of

complementary instruments includes other governmental rule-making bodies, private rule-making bodies, and the legal system.

Other relevant governmental rule-making bodies include bodies like the Internal Revenue Service (IRS), the Securities and Exchange Commission (SEC), the Federal Trade Commission (FTC), the Consumer Product Safety Commission (CPSC), and the Antitrust Division of The Department of Justice (DOJ) in the United States. The IRS, the SEC, and comparable bodies in other countries develop rules for calculating and reporting profits, which can free other regulators from this task. Among the many roles of the FTC is ensuring the veracity of claims that firms make to their customers. When truthful advertising is enforced, a regulator may be better able to rely on consumers to discipline the regulated firm, so the regulator can move away from command-and-control regulation and delegate decision-making to the firm. Because bodies like the CPSC oversee the safety of products that are sold to consumers, other regulators can focus their efforts on different aspects of the firm's operations, such as least-cost production. Similarly, because bodies like the DOJ enforce rules which govern the interactions among firms in an industry, other regulators may not need to develop particular expertise in this area, permitting more of a focus on other elements of production.

Thus, the presence of other governmental rule-making bodies influence the form, function, and scope of regulatory policy. In particular, with other controls imposed by other bodies, a regulator may pursue more targeted, partial forms of regulation instead of regulation that is comprehensive and that controls all aspects of a firm's operations. In addition, though, a regulator may have to alter elements of his most desired regulatory plan because of the control exercised by other governing bodies. For instance, suppose a body like the CPSC imposes much

higher safety standards on the products sold by the regulated firm than the regulator would impose if he controlled all aspects of the firm's operations. If the higher safety standards are more costly to satisfy, then the regulator may have to authorize prices for the firm's products that are higher than the regulator would prefer. Similarly, if a governing body like the DOJ insists that the regulated product be supplied by multiple producers even though the regulator would prefer a single producer, then the regulator may be compelled to worry about new aspects of the firms' operations, such as the extent to which their services differ. In particular, the regulator may wish to ensure that consumers can freely switch among the services of different suppliers, and that different products are compatible with each other.¹¹ Thus, new considerations may arise when there are multiple bodies that oversee a firm's operations, including the coordination of policy among the overseers.¹²

These new considerations will arise even if the "other regulators" are not official government bodies. The presence of professional governing bodies (like the rule-making arm of the American Medical Association, for example) that establish accreditation requirements, codes of conduct, and disciplinary measures for its members can fundamentally alter the regulator's activities. The regulator may serve solely to enforce the edicts of the professional governing body, or it may serve a consultive role when policy is formulated. Alternatively, the regulator may serve a reactive role, vetoing those rules suggested by the professional governing body that do not further the regulator's goals and objectives. For instance, a regulator may strike down an industry ban on advertising of prices when the regulator wishes to enhance the ability of consumers to switch suppliers and thereby limit the earnings of suppliers.

The ability of consumers to discipline suppliers in a regulated industry can depend on

another aspect of the institutional structure in a country ... the ease of consumer access to the legal system. When consumers can easily recover damages for losses suffered due to inappropriate behavior by the regulated supplier (e.g., illegal price discrimination, unscheduled interruption of service, supply of unsafe products, etc.), the regulator may tend to rely more on consumers to monitor the firm's activities and to discipline the firm for inappropriate behavior. When court fees are very high relative to consumers' incomes, when plaintiffs must wait for long periods of time before their cases are heard, when the court is perceived to favor industry over consumer interests, and when compensation for personal loss is minimal, however, the regulator will be less likely to rely on self-interested use of the legal system by consumers to discipline the regulated firm. Instead, the regulator may monitor the firm's performance directly, or establish an internal complaint and penalty system that encourages consumers to report perceived service deficiencies directly to the regulator.¹³

In summary, institutions and complementary control instruments can have important effects on the form, function, and scope of regulatory policy. If institutions limit a regulator's commitment powers, the regulator may be unable to fashion rules that have pronounced impacts on the behavior of the regulated firm. This can limit the scope of regulatory activity, and can restrict the regulator's function to informing consumers rather than enforcing policy. Complementary control instruments can serve to limit the scope of regulatory policy because of divided areas of responsibility. They can also affect the form and function of regulatory policy by altering the perceived costs and benefits of regulations.

5. Industry Conditions.

The purpose of this section is to explain how a variety of industry conditions can

influence the form, function, and scope of regulatory policy. The industry conditions that are considered include the production technology, the nature of consumer demand, and the information structure in the industry.

A. The Production Technology.

The production technology in an industry specifies the manner in which inputs (e.g., capital, labor, and raw materials) can be transformed into final products and services. The production technology influences the form, function, and scope of regulatory policy in number of important ways. For instance, it affects the likely number of suppliers of regulated services, and thus the rules which govern their interaction. It also influences the array of services that are regulated.

When the production technology exhibits increasing returns to scale, so that the unit cost of supplying a regulated product declines as the production level increases, minimal production costs entail supply by a single producer. Effective regulatory policy can be quite different when there is only a single supplier in the industry than when there are a number of suppliers. With only one supplier there is no natural benchmark against which the firm's performance can be compared. Thus, the regulator's task of determining reasonable performance requirements and compensation levels for the regulated firm becomes more difficult. Also, the regulator cannot rely on the discipline that might otherwise be provided by consumers as they switch suppliers when one fails to perform adequately. Consequently, when economies of scale dictate supply by a single firm, the regulator must often engage in lengthy, detailed investigations of the firm's operations before it can fashion reasonable regulatory rulings. Thus, the production technology can have direct bearing on various aspects of the form of regulatory policy, including the manner

in which policy is formulated.

Note, though, that the presence of economies of scale does not preclude the possibility of multiple suppliers in an industry. A regulator may intentionally permit production by two or more producers even though a single producer could serve all demand at lower cost.¹⁴ The extra costs incurred when two or more firms produce may be outweighed by the benefits that result from competition among suppliers. Competition can force suppliers to reduce prices to consumers below the levels a regulator who was uncertain about the true capabilities of a monopoly supplier would enforce. Competition can also spur more rapid product innovation and induce the supply of higher quality products.

Whether the absence of economies of scale leads naturally to multiple producers or whether a regulator decides to encourage supply by multiple producers despite the presence of scale economies, the form, function, and scope of regulatory policy can be quite different when there are multiple suppliers of a product than when there is only one supplier. For example, the regulator may rely less heavily on command-and-control regulation to dictate the firm's activities. Instead, competition among suppliers may be employed to motivate them to act in the best interests of consumers (e.g., to keep prices close to minimum possible costs). When competition prevails, the regulator's role may be more to inform consumers about firms' activities and their performance than to dictate specific actions and performance levels directly.¹⁵ In addition, the regulator may take actions to support the activities of developing firms (e.g., subsidize the research and development or the infrastructure development of these firms) to ensure they can ultimately function as viable competitors.¹⁶ The regulator may also enhance the ability of consumers to switch from one supplier to another (by prohibiting fees for

switching suppliers or requiring that all products supplied by regulated producers be technologically compatible, for example).¹⁷ All of these activities can strengthen the effects of competition in the industry, thereby lessening the need for direct regulatory oversight.

If he doesn't act to facilitate direct market-based competition among multiple suppliers, the regulator can create competitive pressures among suppliers in other ways. For instance, the regulator may devise compensation programs based on relative performance criteria.¹⁸ The firm that achieves the lowest costs of production in the industry or the highest level of product quality may be permitted to earn higher profits, for example. Of course, the regulator needs to correct for innate differences among suppliers when designing such relative performance policies. For instance, in the electric power industry, if some firms have more abundant supplies of water power in their operating regions than others, these firms may have a natural cost advantage in generating electricity that must be accounted for.

Actual competition is not always necessary to discipline an incumbent supplier. The threat of potential competition can induce a firm to minimize production costs and enhance product quality.¹⁹ Regulatory form can be structured to take full advantage of this threat. For instance, a firm's right to serve as a monopoly supplier may be limited to a prespecified period of time. At the end of the specified time period, the right to serve consumers may be auctioned off to the highest bidder, or consumers might vote on whether to renew the license of the incumbent supplier or to procure service from a new supplier.²⁰ The threat of losing one's franchise can provide strong motivation to perform diligently.

Sound reasons do exist, though, to limit the reliance of regulatory policy on actual or potential competition. Recall that one of the many potential objectives of regulators is to

promote more equitable outcomes. At times, this objective can be achieved most readily by prohibiting production of regulated services by firms other than the incumbent monopoly supplier. To illustrate, consider the telecommunications industry. In some jurisdictions, the policy of implementing relatively high prices on long-distance telephone calls has been adopted in order to allow the monopoly supplier of telecommunications services to earn a reasonable level of profits while keeping the price of access to the telephone network and the price of local telephone calls relatively low. The purpose of this policy is to ensure that even citizens with very low levels of income can afford to purchase basic telephone service.

A policy of using enhanced revenues from one service to offset limited revenues from another service can be undermined when unrestricted entry into the regulated industry is permitted. If prices from long-distance telephone service are set well in excess of costs while prices for local telephone service are set below cost, a competitor may wish to supply only long-distance telephone service at a price that is less than or equal to the price charged by the regulated supplier. While such supply may be profitable for the entrant and welcomed by consumers of long-distance service, it can leave the incumbent supplier with insufficient revenues to offset the losses incurred in providing local telephone service. Consequently, the intentional regulatory policy of cross subsidization will not be compatible with unfettered entry into the industry.

Of course, regulatory policy can sometimes be redesigned to take advantage of the benefits of competition while continuing to promote such social goals as income redistribution. For instance, in the telecommunications setting just described, new suppliers of long-distance telephone service might be charged a fee for the right to operate. The revenues from these fees

could be employed to offset some of the financial burden borne by the incumbent supplier in providing local telephone service at uneconomic rates. Alternatively, new entrants might be required to provide some local telephone service if they wish to supply long-distance service.²¹ A third possibility might be to restructure regulated prices. For instance, when competitors are allowed to supply long-distance service, it may not be advisable to attempt to keep the price of telephone service below cost for all customers. Only those customers with particularly low income (e.g., those who participate in other government assistance programs) might be eligible for a deeply discounted price for local telephone service. It is important that alternatives like these be considered when technological change renders competition feasible. The choice facing regulators is not simply whether unfettered competition should be allowed or prohibited, taking existing regulatory policy as given. Regulators must determine whether competition coupled with appropriate changes in regulatory policy can better meet regulatory objectives than can the best regulatory policy that prohibits competition.

The production technology also influences the proper scope of regulatory oversight. Often there are many components of the service provided by regulated suppliers. For instance, the supply of electric power involves both the generation of electricity and its transmission to customers. While a regulator might oversee all elements of production in some circumstances, he might regulate only a subset of the components in other circumstances. In particular, suppose the production technology is such that: (1) total production costs are no higher when different firms produce the different components of a service than when a single firm produces all components; and (2) there are limited economies of scale in producing one or more of the components (e.g., the generation of electricity). The best regulatory policy under these

conditions may involve deregulation of the components for which there are limited economies of scale (e.g., electricity generation) while maintaining regulatory control over the operations of the monopoly supplier of the components of service characterized by pronounced economies of scale (e.g., electricity transmission). Such a policy can take advantage of both the benefits of competition and the cost savings provided by scale economies.

Of course, new considerations arise when some components of production are regulated and other components are not regulated. For instance, in the electricity example just described, it is important that the regulated producer of transmission services not grant special favors and privileges to an unregulated but affiliated subsidiary that generates electricity. A policy that mandates symmetric treatment of all potential input suppliers can be advisable in such a setting. Special precautions may also be needed to ensure an adequate supply of quality. When components of a service are provided by different suppliers, it may be difficult to discern which supplier is to blame when an inadequate level of quality is delivered. For instance, it may not always be trivial to determine whether an unscheduled power outage is caused by the failure of a generating firm to supply the amount of power it promised or by problems with the transmission facilities. When all aspects of electricity supply are conducted by a single firm, it can be less important for a regulator to pinpoint the exact source of a problem. If the single regulated firm is held financially responsible for any reduction in quality, the firm can be induced to determine the source of and eliminate quality problems. In contrast, when the regulated firm supplies only a component of the regulated service, the regulator will not want to penalize the firm for quality problems that are caused by other suppliers and that are beyond the control of the regulated firm. Thus, it may be important to develop better monitoring

technologies to determine the source of quality problems or take other steps to avoid quality problems when the different components of a regulated product are supplied by different producers.

B. Consumer Demand.

A second feature of the industry that can affect the form, function, and scope of regulatory policy is the nature of the regulated product and its consumers. If the regulated product is a basic commodity that is considered essential for everyday life, society may wish to ensure the product is available in abundant supply on reasonable terms to all citizens. Clean water and electricity are examples of these essential products in many countries. Consumers often have inelastic demand for these essential services, since they would be willing to pay large sums of money for these services. To avoid expropriation of consumers with inelastic demand, regulation which limits the price a firm can charge for an essential service can be useful. This is particularly true when economies of scale render production by a single firm most economical, so the limits on price increases naturally imposed by competition are not available. In contrast, if the product in question is more of a luxury than a necessity, consumers will tend to purchase the product only if its price is sufficiently low, which puts a natural limit on the ability of the producer to expropriate consumers.

The presence of externalities in consumption can also influence the form, function, and scope of regulation. To illustrate, take the case of communicable diseases. Individual members of society may have insufficient incentive to consume the vaccine if no regulations are imposed, particularly if an individual does not take into account the potential adverse consequences for others if he contracts the disease. Therefore, regulations may be designed which require all

individuals to consume the vaccine. The government may also subsidize this consumption, particularly if income redistribution is an important goal of government. Regulations may also be imposed to limit activities that involve negative externalities. For instance, limits on the amount of pollutants a firm is allowed to expel in the course of production are common.

Consumer characteristics can also influence the form, function, and scope of regulatory policy. To illustrate, the small physical size and undeveloped mental capacities of children are often thought to warrant special protection for children that is not extended to adults. Government agencies designed to limit child abuse are not uncommon, and regulations are often imposed that limit the activities of minors (e.g., voting, consuming alcohol, and enlisting in the military). Similarly, the need to regulate products purchased mainly by large, sophisticated, well-informed businesses may be less pronounced than if the most common purchaser is a relatively unsophisticated, uninformed household. Sophisticated purchasers are often better able to secure substitutes for products whose announced price is considered to be too high. Furthermore, a purchaser who has the potential to buy many units of the product often has a stronger position from which to bargain for concessions from the supplier relative to a purchaser who, at most, will consume a negligible fraction of the supplier's sales.

C. Information Structure.

The information structure in an industry is another important determinant of the form, function, and scope of regulatory policy. When critical information is difficult for consumers to discern, and when there are large economies of scale in information collection and dissemination, a natural role emerges for the regulator as an information provider. For example, consider a setting where it is difficult for consumers to evaluate the safety of a product (e.g.,

a new medicine) unless they actually purchase and use the product, but where safety can be ascertained fairly easily by trained experts operating under controlled conditions in a laboratory. In such a setting, social resources can be conserved and the sale of unsafe products can be avoided if a testing facility is established and firms are not allowed to sell products that do not pass the safety tests conducted at the facility. In this instance, where a central authority can collect relevant information at a relatively low cost while consumers face prohibitive costs of collecting the information, the form and function of regulatory policy will often encompass centralized monitoring and enforcement of standards.

In other instances, it may be relatively inexpensive for consumers to discern relevant product information, but prohibitively costly for a central authority (like the government) to do so. For example, consumers may be readily able to observe the courtesy, timeliness, and attention with which services are delivered, while a person who is not party to the transaction may be unable to accurately observe these aspects of delivered service. In such circumstances, centralized monitoring and control will be prohibitively costly and/or ineffective at enhancing the courtesy, timeliness, and attention with which services are delivered. A more effective policy would employ the information that consumers receive naturally at little or no cost. Such a policy might set up a facility to receive and record consumer complaints and penalize the regulated supplier more harshly the larger the number of complaints received, for example.²² Alternatively, regulatory policy might provide consumers with information about potential alternative suppliers, thereby encouraging consumers to abandon suppliers that provide inadequate service. Thus, the same regulatory goal of promoting high-quality service and products is best achieved through different regulatory form and function when the relative costs

of information acquisition differ.

The costs of acquiring information affect the form, function, and scope of regulation in other ways. For instance, when it is very costly to measure key dimensions of certain activities, proxies may be measured and controlled instead. To illustrate, a common goal in industrial settings is to limit the pollutants firms expel during production. In theory, these pollutants could be limited either by taxing firms for each unit of pollution expelled, or by prohibiting pollution in excess of a specified level. In practice it can be very costly, if not impossible, to accurately measure the amount of pollution expelled by a firm. Consequently, alternative methods of control are commonly employed. One popular method is to dictate the amount and type of pollution abatement equipment that must be installed. It has been common in the past to require electric utilities to install industrial scrubbers to help purify the exhaust that is released into the atmosphere. In addition, restrictions have been placed on the type of inputs (e.g., hard coal versus soft coal) that can be used in the production process. These indirect forms of control can be more effective than the direct control of pollution itself when the costs of monitoring and enforcing direct control are prohibitive.

The locus of information in an industry can also affect another dimension of regulatory form: the nature of the regulatory process. When many individuals other than the regulator possess information that is relevant for making decisions, it can be important to have an open regulatory process in which many individuals are afforded the opportunity to provide information to the regulator before regulatory policy is determined. Most hearings to set prices for public utilities in the United States are open to all interested parties, and consumer groups commonly supply information about consumer preferences while producers supply information about

production costs. In contrast, when all relevant information is known to the regulator, the need for open hearings may be less pressing. If little relevant information is revealed during a lengthy, open regulatory process, such a process may serve more to retard than to inform the design of regulatory policy.²³

The most appropriate regulatory process will also depend on the pace of technological change in the regulated industry. Rapid technological change can make it very difficult for a regulator (particularly one with limited resources, as explained in section 3) to remain well informed about all aspects of the actual and potential activities of the regulated firm. Although lengthy hearings and investigations to improve the regulator's information can be valuable, they can also be very costly. In particular, they can slow the introduction of new products and new pricing structures that better reflect production costs. Sometimes, unregulated competitors can intentionally prolong hearings in order to reduce the speed with which the regulated supplier can respond to competitive pressures. Consumers can be hurt by this process, and inefficient industry structures can result.

Regulatory form and scope can be structured to avoid such problems. In particular, greater decision-making authority can be delegated to the regulated firm. This delegation can come in the form of allowing the firm to choose one compensation plan from a well-structured menu of alternative compensation plans (as described in section 3), or by coupling less *ex ante* scrutiny of the firm's proposed activities with more severe penalties (e.g., lower prices or lower allowed rates of return) if observed industry performance differs markedly from the firm's predictions.

In summary, industry conditions can have important impacts on the form, function, and

scope of regulatory policy. The production technology in an industry can influence the extent of competition that is feasible. The extent of competition, in turn, can have profound effects on policy design. The characteristics of consumers and the products they consume help determine whether the proper role for the regulator is an informing role or an enforcing role. The information structure in an industry also influences this calculation, and, in addition, influences how much decision-making authority the regulator should delegate to other parties.

6. Conclusions.

The purpose of this research was to explore some of the principles that govern the design of regulatory policy. Three key factors that influence the form, function, and scope of regulatory policy were identified and analyzed. These factors are regulatory objectives and resources, the institutional structure of the environment for which regulatory policy is designed, and various industry conditions in the regulated environment.

Different regulatory objectives were argued to have direct effects on the types of regulatory controls that are imposed. When very focused, specific objectives are paramount, for example, the form, function, and scope of regulatory policy may be similarly focused. Limited resources can also affect the nature of regulatory activities. They can cause regulation to be more reactive than proactive, and lead to substantial delegation of decision-making authority.

The institutional structure of the country in which regulation is imposed can affect the regulator's commitment ability. The form, function, and scope of regulatory policy can be severely restricted when the regulator has limited ability to deliver promised rewards or threatened penalties. The proper scope and function of regulation may also be fairly limited

when technological conditions allow competition to discipline producers. Sophisticated buyers with economic power can also reduce the need for regulatory control, and rapid technological change can render comprehensive command-and-control regulation ineffective or debilitating.

For expository purposes, the discussion in this paper has isolated individual influences on regulatory policy. In practice, the effects identified here and many others all influence simultaneously the proper formulation of regulatory policy. The simultaneous operation of all these forces is what makes regulatory design an intricate and complex undertaking.

In closing, some additional influences on observed regulatory policy that were afforded inadequate attention here are briefly noted. Inertia is one such influence. Often, regulatory controls that served an important purpose at one point in time persist even though they no longer serve their intended purpose. The controls can persist because they favor a particular group or constituency, and that constituency is able to convince the regulator to keep the controls in place. For instance, subsidies to firms and tariff protection against competing imports often continue long after they have served the intended purpose of promoting the development of an infant industry. The firms that benefit from the subsidies and protection have every incentive to argue for their continuance, even though the firms are fully capable of competing against foreign producers. When there is limited public outcry against continuing the special treatment, and strong urging by the affected firms for its continuance, the regulator may be convinced to continue the treatment, even though it no longer serves its intended purpose.

Regulation may also be influenced by the personal ambitions of regulators. Even though a regulator may be charged with protecting consumers, he may be diverted from this goal by promises of personal rewards for favorable treatment offered by the regulated firm. In this way,

the regulator may be captured by the regulated firm, and so the form, function, and scope of regulation may not properly reflect the goals and objectives of society as a whole.²⁴

Regulations may also be influenced by personal goals and objectives of regulators that, while differing from perceived social goals, are not motivated by self interest. Regulators may have genuine differences of opinion with society at large or with other government officials about what is best for society. Where goals and objectives conflict, the goals that are pursued depend in large part on the autonomy regulators are granted and on the balance of power among government bodies. When attempting to understand the form, function, and scope of regulatory activity, it is important to understand the entire structure of government influence and control. Particular regulations in particular industries are often partial, interdependent components of this more comprehensive structure.

FOOTNOTES

1. To illustrate, the state of Nebraska currently employs a form of potential regulation in its telecommunications industry. The primary provider of telecommunications services is not permitted to raise the price of basic local service more than ten percent in any year. This restriction aside, the operations and performance of the firm are not controlled by the state's public utility commission (PUC) unless two percent of the firm's customers formally complain to the PUC about the firm's activities. (See Mueller (1993).)
2. Development can take many forms. For instance, it may involve installing state-of-the-art technology (e.g., converting from analogue to digital switches in the telecommunications industry) or increasing the reliability of the service provided (e.g., installing back-up transmission facilities that can be employed to carry voice or data traffic in the event of failure of the primary transmission facility in the telecommunications industry).
3. In the United States' telecommunications industry, different states encourage infrastructure development in different ways. Some states mandate that the regulated firm make available to rural customers the same modern services (e.g., enhanced calling capabilities and features like call waiting and caller identification) that the firm finds profitable to offer to urban customers. Other states are less specific in their mandates, but do require the regulated firm to reinvest a portion of its earnings in infrastructure development. This development commonly takes the form of converting copper transmission lines to fiber lines, and replacing analogue switches with digital switches.

4. Some might argue that this sequential approach to meeting multiple objectives has been pursued in the telecommunications industry in the United States. In the early 1900's, regulation of the telecommunications industry focused on providing reliable telephone service and interconnection capabilities to as many customers as possible. (Initially, telephone service was provided by different companies, and the customers of one company were not able to call or receive calls from the customers of a different company.) By the mid 1900's, interconnection capabilities had been ensured, and regulators had turned their attention toward limiting the profits of the monopoly provider of telecommunications services. (Mueller, 1993, pp. 13-14)
5. This policy is discussed in greater detail in Sappington and Sibley (1992). Also see Brown and Sibley (1986), Sibley (1989), and Wilson (1993).
6. The U.S. Federal Communications Commission allows the local exchange carriers (LEC's) to choose among different methods of compensation for their interstate access charges. If the LEC's choose to reduce their average (inflation-adjusted) access charges by 3.3% annually, they share with consumers fifty percent of their earnings that constitute a rate of return on capital between 12.25% and 16.25%. All earnings above 16.25% are returned to customers under this plan. If, however, a LEC chooses to guarantee a higher 4.3% annual real reduction in average access rates, the firm is only required to share fifty percent of its earnings that represents a rate of return between 13.25% and 17.25%. Only if earnings rise above a 17.25% return are they all awarded to consumers. Thus, a LEC can secure the opportunity to retain more of its earnings by guaranteeing lower prices to its customers. (For additional details, see Federal

Communications Commission, 1990.)

7. For additional thoughts on how a regulator with limited information should design the set of options he offers to a regulated firm, see Baron (1988), Besanko and Sappington (1987), Caillaud et al. (1988), Laffont and Tirole (1993), or Sappington (1991).
8. For instance, if the regulatory goal is simply to ensure that consumers are not misled by false advertising, the regulator can focus on developing the ability to assess the veracity of advertisements and to impose penalties (e.g., monetary fines) when misleading advertising is identified. In contrast, if the regulator wishes to protect consumers more broadly, for example by ensuring that they are able to secure high-quality service at low prices, then a more elaborate system of regulation will generally be required (e.g., a system to monitor quality and to limit prices to "reasonable" levels).
9. For a detailed analysis of the interaction between the properties of a country's institutions (such as the strength of its judiciary) and the design of regulatory policy for the country, see Levy and Spiller (1993, 1994).
10. See Levy and Spiller (1993), and Vickers and Yarrow (1988) for additional thoughts on this matter.
11. For an overview of the many regulatory considerations associated with the compatibility issue, see Besen and Saloner (1990), for example.
12. See Baron (1985) for one formal treatment of this issue. Baron's analysis illustrates the important observation that losses to society can result when regulatory policy is not

properly coordinated across regulatory agencies. Thus, in addition to designing the best policy for a particular regulatory body given the policies adopted by other regulatory bodies, it is important to ensure that the various regulatory policies are optimally coordinated. Such optimal coordination can be quite subtle. Sometimes, it can be best to eliminate the duplication of powers. (For instance, if significant resources and expertise are required to carefully analyze the social benefits and costs of a proposed merger between two competitors, then it may be best to conserve these resources by granting a single regulatory body sole authority to approve or disapprove proposed mergers.) In other instances, intentional duplication of powers can comprise part of an optimal system of checks and balances. (For example, if large, powerful firms are thought to have undue influence over policymakers, it can be best to disperse rulemaking authority, so as to make it more difficult for the regulated firm to "capture" all relevant regulators.) (See Sah and Stiglitz (1986) for additional thoughts on how the arrangement of decision-making authority can influence the likelihood of correct social decisions when government decision-makers make mistakes in judgement because the information at their disposal is imperfect.)

13. In Great Britain, for example, British Telecom is obligated to compensate its customers directly if the company fails to meet established service requirements. For instance, British Telecom must pay a customer five pounds for every day beyond two that an actual repair or installation lags the scheduled repair or installation. (See Rovizzi and Thompson (1992).)
14. See Nalebuff and Stiglitz (1983).

15. For example, when many banks and mortgage companies compete to provide loans to homeowners, a government may not need to regulate mortgage loan rates. However, the government might want to impose standards on how the key terms of the mortgage (e.g., the annual rate of interest, the duration of the loan, penalties for premature repayment of the loan, application fees, and other fees) are disclosed to consumers. Standard reporting formats enable consumers to better compare the products of alternative suppliers, and can thereby enhance competition among suppliers.
16. In the United States, the Small Business Administration provides low-interest loans and counselling to small businesses, particularly new entrants. In many industries (e.g., the telecommunications industry), it is common for governments to regulate the activities of large incumbent suppliers, but to exempt new suppliers from regulatory scrutiny.
17. Following the entry of MCI and Sprint into the long-distance telecommunications industry in the United States, the Federal Communications Commission imposed rules that facilitated the ability of consumers to switch from the incumbent supplier of long-distance service (AT&T) to one of its new competitors. In particular, consumers were permitted (at no charge) to designate a long-distance provider other than AT&T as their primary carrier, so that their long-distance telephone calls would automatically be carried by the designated carrier.
18. See Shleifer (1985) for a theoretical analysis of how to design relative performance schemes. The Mississippi Public Service Commission has implemented a "Performance Evaluation Plan" that bases the allowed rate of return for the Mississippi Power

Company (MPC) both on the company's own performance and on the returns earned by other comparable utilities. Under the plan MPC can earn no more than comparable firms earn if MPC's own performance (in terms of residential rates, customer satisfaction, safety, plant availability, etc.) is judged to be poor. However, MPC will be allowed to earn at least what comparable firms earn, and often more, if MPC's performance is judged to be excellent.

19. See Baumol, Panzar, and Willig (1982) for a detailed theoretical treatment of this issue.
20. See Laffont and Tirole (1988) and Williamson (1976) for additional thoughts on how such franchise policies might be designed.
21. In the cable television industry, local municipalities often require the selected supplier of cable service to offer public service channels at no additional cost to subscribers, and/or to provide special services (e.g., special broadcast channels) to local schools or community groups.
22. In many regulated industries, the punishment for inadequate quality supply is more implicit than explicit. While most state public service commissions in the United States have a long list of quality standards that telecommunications providers are supposed to meet, it is uncommon for explicit monetary penalties to be associated with failure to achieve the standards. There are exceptions to this general rule, however. For instance, in Georgia, the share of its earnings that Southern Bell is permitted to retain depends upon its compliance with specific quality standards. As noted above, explicit penalties are also imposed on British Telecom for failure to meet service and repair obligations.

Recall, also, that under the Performance Evaluation Plan instituted in Mississippi, the allowed earnings of the Mississippi Power Company are closely linked to its measured performance on a variety of dimensions.

23. To illustrate, when a developing country's overriding concern is to begin delivery of a standard, essential service (e.g., water, electricity, or basic telephone service) rather than to fine-tune the pricing structure in a sophisticated delivery system, an open regulatory process may provide very little relevant information.
24. For a more detailed discussion of the capture theory of regulation, see Stigler (1971) and Laffont and Tirole (1993).

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