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A POLICY-MAKING-AS-ARGUMENT PERSPECTIVE ON ALTERNATIVES TO RATE OF RETURN REGULATION

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FOREWORD

From time to time the NRRI brings to publication in its Occasional Paper series studies or reports done by others that are likely to be of general interest to our clientele. This report was reworked by the author from his June 1990 dissertation done at the School of Public Policy and Management at The Ohio State University. Dr. You was then located at NRRI while researching and writing his dissertation and had previously worked at a state commission staff before coming to OSU.

His report adds to the current discussion of traditional rate of return regulation and alternatives thereto with special reference to efficiency arguments. Dr. You's study attempts explicitly to introduce normative aspects of policy choice making in an orderly way by an application of argument theory.

I think you will find the piece of some interest.

Douglas N. Jones
Director, NRRI
Columbus, Ohio

December 31, 1990

ACKNOWLEDGMENTS

I wish to thank The National Regulatory Research Institute for funding my dissertation research. Especially, I would like to express special thanks to Institute Director Dr. Douglas N. Jones. He not only provided invaluable comments and criticisms on my dissertation but also shared the idea to publish the dissertation in a condensed form. I am also very grateful to the Institute's editor David Wagman for his suggestions during the development of this report. Their contributions have considerably improved the quality of this report.

CHAPTER 1

INTRODUCTION

Traditional rate of return (ROR) regulation methods have often been characterized as a "cost-plus" system. Under ROR regulation, a regulated firm's performance has little effect on its profit and thus has little incentive to keep costs down. That is, the firm submits its accounting records after the service has been provided and then the commissions allows total revenues which compensate for costs reasonably incurred to provide that service. This cost-plus nature of ROR regulation has been blamed for not providing incentives for the efficient use of resources. The underlying reason for such behavior is simple: the costs incurred by the regulated firms are passed on to customers.

To be more specific, under the basic concept and operation of ROR regulation itself, several efficiency problems have long been identified by scholars. One is that utility firms are likely to distort resource allocations and/or to inflate their expenses. Averch and Johnson showed that firms subject to ROR regulation have incentives to use capital intensive input mixes, deviating from the cost-minimizing levels, if the rate of return on invested capital allowed by regulatory agencies is greater than or at least equal to its market return.[1] Another possible consequence is that the firms may not put physical input resources to their best possible use, which is supposed to be achieved by competitive firms.[2] For example, employees may not make their best effort to work or unnecessary personnel may be hired. Moreover, the firms may pay more for their purchase of input resources by weak bargaining with capital equipment suppliers[3] or labor unions, pay excessive salaries to managers, and/or

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[1] H. Averch and L. Johnson, "Behavior of the Firm under Regulatory Constraint," *American Economic Review* 52 (December 1962): 1053-1069.

[2] H. Leibenstein, "Allocative Efficiency vs. 'X-Efficiency,'" *American Economic Review* 56 (1966): 392-415.

[3] F. Westfield, "Regulation and Conspiracy," *American Economic Review* 55 (1965): 424-443.

incur heavy expenditures on advertisement to improve their image and public relations.[4] Finally, it has also been argued that regulated firms do not have sufficient motivation for technological progress.[5]

Addressing these problems, researchers have proposed alternatives to ROR regulation ranging from minor modifications in the existing system to complete deregulation. While considerable efforts to develop new alternatives have been made and some alternatives have drawn intensive discussions, the definitive study which comprehensively examines the relative merits and drawbacks of all the existing alternative regulatory modes and their workability in current market structures has not yet been written and only a limited literature is available.

Moreover, the studies that recommended alternatives appear to assume that ROR regulation results in inefficiency. What is lacking is an effort to connect efficiency questions about ROR regulation to the development of alternatives and to a comparative assessment of these alternate regulatory devices. While the existing studies on alternatives to ROR regulation provide some insights into the relative merits of the alternatives, they are incomplete in that they have reviewed only a subset of the available alternatives and have yet to establish a comprehensive set of evaluation criteria. Moreover, most of the previous studies have brought scientific and methodological rigor to the analysis of regulation, but they lack the analysis of normative values which result from implementation of the proposed alternatives. For policy analysis to be useful to decision makers, it must incorporate both scientific rigor and normative values.

The primary objective of this study is to construct a policy-making framework accommodating both analytic and normative approaches for advancing an alternative to ROR regulation. Its secondary objectives are to supplement the shortcomings of the previous studies of alternatives to ROR regulation and to organize information within this framework. Thus, this study will:

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[4] A. Kahn, *The Economics of Regulation: Principles and Institutions* (Cambridge, Massachusetts: The MIT Press, 1988), 28.

[5] R. Stevenson, "X-Inefficiency and Interfirm Rivalry: Evidence from the Electric Utility Industry," *Land Economics* 58 (February 1982): 52-66.

- develop a framework to examine the regulation of public utilities and illustrate the implementation of that framework in analyzing alternatives to ROR regulation,
- establish evaluation criteria and use these criteria to compare alternative regulatory schemes.

This report is organized as follows: chapter 2 will discuss the methodology and conceptual framework and will introduce a policy-making-as-argument framework. Chapter 3 will discuss the effects of ROR regulation on the behavior of regulated firms, especially on efficiency. Chapter 4 will develop criteria for evaluating the policy alternatives to ROR regulation. Chapter 5 will evaluate alternative regulatory mechanisms based on the efficiency, equity, and implementability criteria. The final chapter will contain recommended policy alternatives based on the evaluation made in chapter 5. This chapter will conclude with a discussion of the contribution of the policy-making-as-argument framework to regulatory decision making as well as observations about the significance and the limitations of this study.

CHAPTER 2

METHODOLOGIES AND CONCEPTUAL FRAMEWORK

Methodologies of Public Policy Inquiry

Public policy inquiry has been influenced mainly by the positivistic approach and has attempted to employ the scientific method. Students of public policy who believe in the traditional positivistic methodology and its variants have placed emphasis on the production of knowledge with scientific rigor. Their methodological principles stem from the natural science inquiry which is characterized by the value-fact dichotomy, the universal or general applicability of knowledge, ties to observable phenomena, and their causal and formal relationships.

However, unlike natural or physical phenomena, human actions are affected by values that are internal and particular to individuals. The relationships of human actions are more likely to be interdependent, dynamic, and multidimensional. Such relationships are well observed in a policy making process. Policy in a democratic society is seen as a product of public debate where individuals with various interests and values attempt to arrive at a consensus.[6] The participants in the policy making process are involved in evaluative and prescriptive activities to determine what policies are good and what actions are right to take.[7] That is, the scope of public policy study ranges from describing and explaining policy problems to prescribing and advocating specific policy actions to accommodate those problems.

In such a situation, empirical and analytical policy study from the positivistic perspective has special limitations when attempting to

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[6] E. Redford, *Ideal and Practice in Public Administration* (University, Alabama: University of Alabama Press, 1958); and D. Truman, *The Governmental Process* (New York: Alfred A. Knopf, 1951).

[7] P. Taylor, *Normative Discourse* (Englewood Cliffs, New Jersey: Prentice-Hall, 1961). He refers to justifying judgments and prescriptions as normative discourse.

investigate the normative aspects of policy making. The resulting knowledge may go unused by decision makers and be isolated from public discourse.[8] To address this problem, an increasing number of students of public policy have attempted to develop an alternative approach which integrates empirical and normative approaches in the field of public policy. One alternative which draws growing attention is Toulmin's argument theory.[9]

Policy Making As Arguments

Unlike personal decision making, public policy making is made through group discourses in which multiple policy makers with different information and values advocate their claims. It is no surprise that all relevant stakeholders tend to participate in the discourses and that the decisions should be further subject to public review. Under situations with such dependency on public discourse and necessity of openness to the public, policy making increasingly relies upon the soundness of the reasons given to the claims rather than formal logical necessity. Policy makers typically are faced with situations in which they have to make decisions with limited information and with time constraints. In addition, problems, decision criteria, and solutions are often ill-defined. Therefore, policy makers cannot draw a mechanical conclusion with certainty. Rather, they have to rely partially on value judgments and try to build a consensus. That is, policy makers with various values and interests are likely to argue over the adoption of an alternative among multiple options. They will advance a favored alternative while refuting other alternatives. During this process, effective communicators who intend to influence other participants provide reasons in support of their claims. An argument is such a claim with reasoned support.

Using jurisprudence as a metaphor, Toulmin introduced an exemplary structure of argument in this field. In an argument, a **ground** or a **datum**

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[8] F. Fischer, *Politics, Values, and Public Policy: The Problem of Methodology* (Boulder, Colorado: Westview Press, 1980).

[9] S. Toulmin, *The Uses of Argument* (Cambridge: Cambridge University Press,1958).

is transformed into a **claim** under a series of assumptions (**warrant**, **backing**, and **rebuttal**) with a certain degree of probability (**qualifier**). Toulmin's argument structure consisting of these six elements is the generalized and simplified version of complex propositions used in the legal process.

The six elements of Toulmin's argument structure encompass issues ranging from the investigation of policy problems to the problem solution with the provision of supporting evidence. Moreover, the visual outlay representing the relations of the elements has the capacity to advance and criticize information, assumptions, and claims more systematically and explicitly, and to evolve until a final claim is settled upon.[10]

Dunn extended Toulmin's argument structure to the field of social science including public policy. In his application of argument to public policy analysis, Dunn argues that "policy arguments" go beyond the mere production of information or the justification of favored policy alternatives and lead to the process of adopting appropriate policies to resolve problems.[11] That is, a policy argument is not only a form which arranges and composes information and evidence, but also "the main vehicle for conducting debates about public policy issues."[12] His policy argument structure has the same six elements as Toulmin's, but with paraphrasing to make them relevant to policy analysis:

1. Policy-Relevant Information: Policy-relevant information is the starting point in all policy arguments. It provides underlying foundation for policy claims. Information about public policy issues may be produced from various sources ranging from "hard" science data to common knowledge, using multiple methods.

2. Policy Claim: A policy claim is the conclusion which is being sought from policy-relevant information. Policy claims have to do with how people or governments behave. Therefore, claim statements often accompany the word "should."

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[10] A. Freeley, *Argumentation and Debate: Reasoned Decision-Making*, 5th ed. (Belmont, California: Wadsworth Publishing Co., Inc., 1981).
[11] W. Dunn, *Public Policy Analysis: An Introduction* (Englewood Cliffs, New Jersey: Prentice-Hall, 1981), 43.
[12] Ibid., 41.

3. Warrant: A warrant is a statement which justifies the move from policy-relevant information to policy claim. Its main role is to provide evidence for accepting the policy claim. To this end, policy makers may rely upon experts' authority, intuition, scientific methods, or ethical principles.

4. Backing: A backing is any additional evidence to support warrants which are too weak to be sustained at their face value.

5. Qualifier: A qualifier expresses the degree of certainty or cogency which is attached to a policy claim. The degree of cogency may be expressed on a continuum consisting of certainty, probability, plausibility, and possibility. These terms are not discrete values, but represent relative likelihood.

6. Rebuttal: A rebuttal is a counter-assumption or evidence which may destroy the degree of cogency of a original policy claim. Therefore, the original claim is unacceptable or acceptable only with weaker qualifications.[13]

To illustrate the structural model of argument, public interest theory of regulation developed primarily based on court decisions can be laid out like figure 2-1. The public interest theory **claims** that government should regulate public utilities, in a manner of balancing consumer interest and investor interest (fair rate of return regulation). The claim is supported by **policy-relevant information** about the public utilities. There are a number of economic and social characteristics of the public utilities.[14] Of these, the literature has given emphasis to two attributes: public utilities are natural monopolies, and their service is essential for modern

[13] Ibid., 42; and S. Toulmin, R. Rieke, and A. Janik, *An Introduction to Reasoning*, 2nd ed. (New York: MacMillan Publishing Co., Inc., 1984), 25-27.
[14] J. Bonbright, A. Danielsen, and D. Kamerschen, *Principles of Public Utility Rates*, 2nd ed. (Arlington, Virginia: Public Utilities Reports, Inc., 1988); and C. Phillips, Jr., *The Regulation of Public Utilities: Theory and Practice* (Arlington, Virginia: Public Utilities Reports, Inc., 1985).

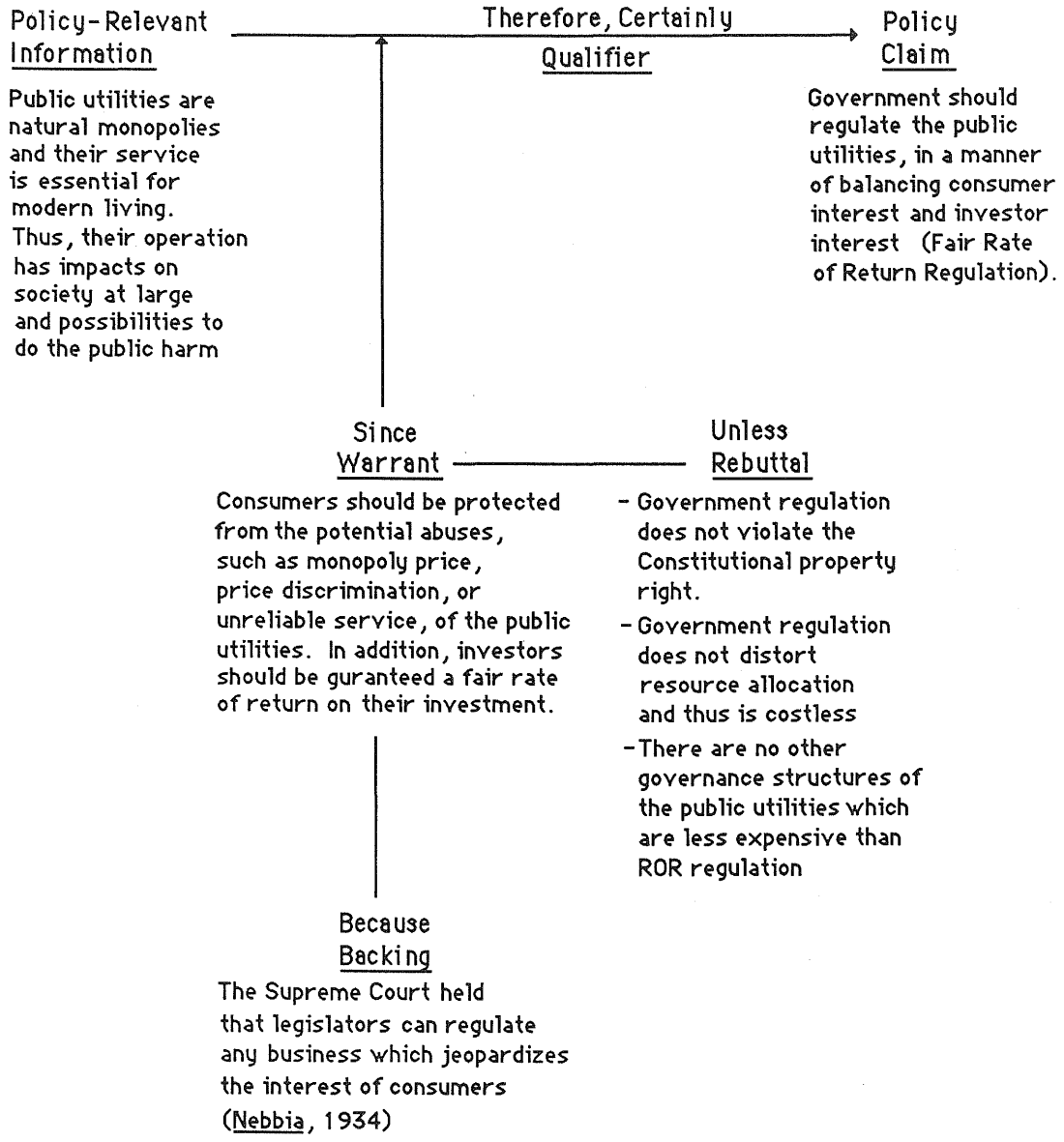

Fig. 2-1. Argument Structure of Public Interest Theory of Regulation

living.[15] Therefore, their operation affects the society at large[16] and has the possibility to do the public harm. The transfer of this information into the claim is based on the normative **warrant**, which the public interest theory maintains, that consumers should be protected from the potential abuses (such as monopoly price, price discrimination, and unreliable service) of the natural monopolies, while investors should be guaranteed a fair rate of return on their investment. However, people who have different normative values may question the relevance of the warrant. In this case, the warrant is further strengthened by the **backing**: the Supreme Court has held that legislators can regulate any business which jeopardizes the interests of consumers.[17] Moreover, the claim will be strong only when no exceptional circumstances exist (**rebuttals**): government regulation does not violate constitutional property rights, government regulation does not affect the utility's economic behavior and thus is costless, and there are no other governance structures of the public utilities which are less expensive than ROR regulation. When these conditions (warrant, backing and rebuttal) are met, the cogency of the claim is very certain (**qualifier**). Since the 1970s, the degree of cogency has been weakened and a number of alternative modes of regulation have been proposed because the last two points of the rebuttal are increasingly questioned. The main task of this research is to investigate the regulatory effects on firm behavior and alternatives to ROR regulation.

Conceptual Framework of the Study

The structure of the report follows the original structure of Toulmin's argument and its application by Dunn to the field of public policy analysis. In addition, the report further articulates the policy argument structure by addressing one of the shortcomings of this traditional argument framework. That is, under the previous argument framework, decisions are likely to be dichotomous, decided upon their own relative merit without consideration of other possibilities. In this

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[15] Bonbright et al., 14-16.
[16] Munn v. Illinois, 94 U.S. 113 (1877).
[17] Nebbia v. New York, 291 U. S. 502 (1934)

report, the framework includes multiple policy alternatives and discusses warrants, backings, and rebuttals along with their alleged claims. This structure is schematically presented in figure 2-2. The figure is in three parts as follows:

- Policy Argument Framework of Research: This figure represents the policy arguments structure, and the relationships between the policy-relevant information, the warrants and rebuttals of policy alternatives, and the resulting policy claims.

- Issues to Be Addressed within the Framework: The issues which are discussed within this framework are tabulated here. Chapter numbers of the report discussing these issues are in parentheses.

- Modes and Techniques of Policy Argument: The modes and techniques used to address the above issues are tabulated here.

More specifically, policy relevant information includes the efficiency problems in ROR regulation. This information will be obtained from the review of theoretical and empirical studies of efficiency effects of regulation (chapter 3). The modes of policy arguments used for this analysis are both empirical and analytical.

A variety of methods have been introduced as alternatives to ROR regulation. They argue that theoretically the introduction of competition to the regulated industry will eliminate resource misallocation and bring about incentives for efficiency, and that efficiency will be improved if firms are rewarded or penalized based on their performance (warrant). Advocates of deregulation often provide the deregulation experience from the previously regulated industries to support further their claim (backing). In addition, policy alternatives not only should be theoretically sound but their assumptions also should be true in practice. For the alternatives to be justified as an implementable policy claim,

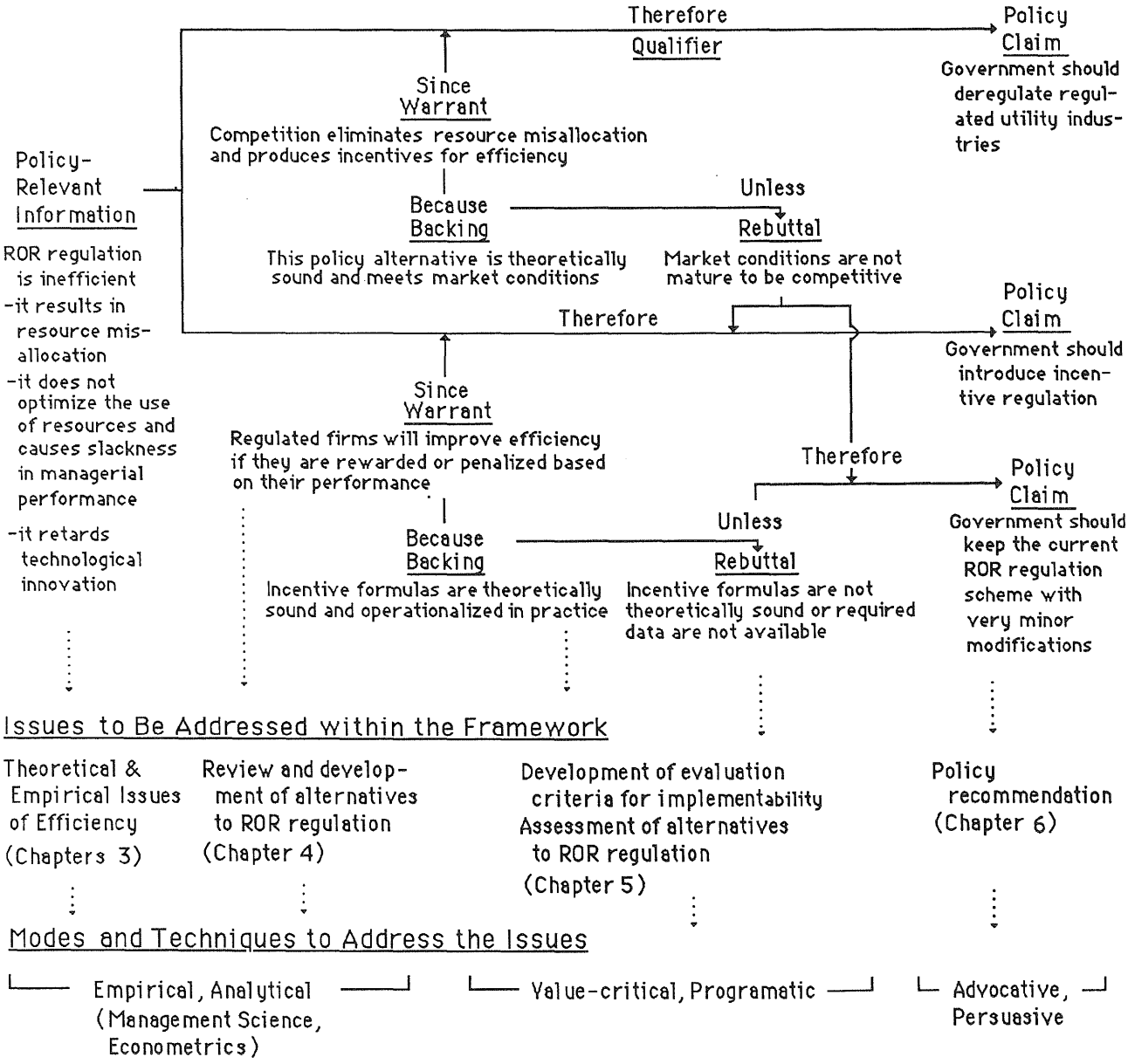

Fig. 2-2. Conceptual Framework of the Study

factors such as market conditions of the regulated industries, transactions costs being incurred to implement alternatives, and various interests of industries, customers, and politicians must be considered (rebuttal). The report will review the alternatives in this context in chapters 4 and 5. Given the differences in the nature and interests of various stakeholders (industry, customers, and regulatory commissions) the policy alternatives will be evaluated from a pragmatic and normative perspective.

The logical sequence of the policy argument structure leads to policy claims. The review of warrants, backings, and rebuttals also provides a qualifier, that is, the degree of cogency of the claims (chapter 6). The approach used to deal with these final elements of policy argument will be advocative and prescriptive.

CHAPTER 3

EFFICIENCY ISSUES UNDER RATE OF RETURN REGULATION

In developing an argument framework, the initial step is to provide policy-relevant information for the support of a policy claim. Since most policy claims concern possible solutions to policy problems, policy-relevant information represents facts about the policy problems from which the claim is being established. Information regarding alternative policy claims to ROR regulation is closely related to the effects of regulation on efficiency. However, alternatives to ROR regulation have often been proposed separately from the investigation of these efficiency issues arising under ROR regulation. Most of them simply assume that ROR regulation results in inefficiency. The clarification of this efficiency issue is a prerequisite for advancing alternate policy claims, since the incorrect formulation of problems is much more likely to result in wrong solutions than the correct formulation.

Efficiency refers to the transforming relationships between a firm's inputs and outputs. Efficiency is often expressed as the ratio of integrated input resources to integrated outputs. This ratio is affected by the way input resources are combined and by the degree to which the firm utilizes them. In addition to such a physical aspect of resource use, efficiency is also viewed from the cost aspect of the firm's purchases of resources, especially in an imperfect market. From a dynamic perspective of time, efficiency is also a function of the technology which the firm employs to produce outputs. These different aspects of efficiency may be called productive efficiency, cost efficiency, and technological efficiency. Beyond such a view of efficiency from the standpoint of internal organization, efficiency is also considered from the point of view of society as a whole. Since resources and goods are not infinite to satisfy human wants, they should be allocated to bring about maximum

welfare to a society. Efficiency from this aggregate, macro, and external perspective of social welfare is referred to as allocative efficiency.[18]

The behavior of regulated firms is affected by various regulatory factors such as regulatory lag, the cost-plus nature of regulation, and political influence. Therefore, regulated firms are likely to deviate from competitive firms' optimal behavior in terms of both production and cost, thereby affecting their efficiency. This chapter reviews the theoretical and empirical studies of the effects of regulation on efficiency.

Regulation and the A-J Effect

The A-J effect implies that since the relative capital cost to labor under ROR regulation is lower than without regulation, the firm does not equate the marginal rate of technical substitution of any two inputs to the ratio of market input costs.

Following Averch and Johnson, a number of regulatory economists have contributed to the extension and clarification of the A-J thesis and have tested it empirically. However, their arguments are in dispute. Inclusion of taxes and uncertain regulatory climates further complicate the predictive power of the A-J effect. An increase in corporate income taxes always serves to reduce capital usage.[19] In the long run it may discourage plant expansion or modernization.[20] To the contrary, tax incentives such as accelerated depreciation and investment tax credits will favor capital intensive firms, thereby aggravating the A-J effect.[21]

The A-J model reflects a static view of the regulated firm, that is, input prices and demand conditions are fixed. However, these factors are

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[18] For detailed explanation of these concepts of efficiency, see M. You, "An Analysis of Alternatives to Rate of Return Regulation: From a Policy-Making-As-Argument Perspective," unpublished Ph.D. Dissertation (Columbus, Ohio: The Ohio State University, 1990).

[19] E. Bailey, *Economic Theory of Regulatory Constraint* (Lexington, Massachusetts: Lexington Books, 1973), 137.

[20] G. Corey, "The Averch and Johnson Proposition: A Critical Analysis," *Bell Journal of Economics* 2 (1971): 358-373.

[21] M. Kafoglis, "Tax Policy and Public Utility Regulation," *Electric Power*, ed. Moorhouse (San Francisco: Pacific Research Institute for Public Policy, 1986), 97-133.

more reasonably considered to be uncertain and affect the firm's decision on the use of input factors. With the variety of actual assumptions of uncertain factors, whether or not they are to be treated as *ex ante or ex post* variables, a number of economists showed that ROR regulation with uncertainty may lead to adverse A-J effects. On the other hand, Das concluded that the A-J effect would be robust with uncertain demand.[22] Crew and Kleindorfer also argued that the firm would tend to increase its capacity under the guise of service reliability, to the extent that service reliability is unregulated.[23]

The nature of regulation is dynamic and uncertain rather than static and straightforward (as assumed by the A-J model) because of the presence of regulatory lag, nonprofit-maximizing behavior, and stochastic demand. Thus, it is hard to draw an irrefutable conclusion on the A-J effect. However, at present, Berg and Tschirhart's conclusion seems to be reasonable: ". . . for public policy, the A-J bias should continue to be recognized as a potential source of inefficiency inherent in rate-of-return regulation."[24]

Regulation and X-Efficiency

X-efficiency is associated with the utilization of the input resources with given knowledge. Leibenstein defines X-efficiency as follows: "Inputs or factors of production may be allocated to the '**right**' decision units. However, there is no need to presume that the decision and performance units involved **must** decide and actually use inputs as effectively as possible. We refer to the difference between maximal . . . utilization and actual utilization as the degree of X-inefficiency."[25] Leibenstein regards the primary source of X-efficiency as motivation associated with

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[22] S. Das, "On the Effect of Rate of Return Regulation under Uncertainty," *American Economics Review* 70 (1980): 456-460.

[23] M. Crew and P. Kleindorfer, "Managerial Discretion and Public Utility Regulation," *Southern Economic Journal* 45 (1979): 696-709.

[24] S. Berg and J. Tschirhart, *Natural Monopoly Regulation: Principles and Practice* (Cambridge: Cambridge University Press, 1988), 365.

[25] H. Leibenstein, "Aspects of the X-efficiency Theory of the Firm," *Bell Journal of Economics* 6 (Autumn 1975): 582. Emphases in original.

degree of work effort. He suggests the following reasons why work effort varies and given inputs are not transformed into maximal outputs: "(a) labor contracts are incomplete, (b) the production function is not completely specified or known, (c) not all inputs are marketed or, if marketed, are not available on equal terms to all buyers."[26] Later, he adds ". . . that detailed supervision of labor is impractical and/or inefficient; hence, there are normally many areas of choice open to managerial as well as other employees in determining how to fulfill their work roles."[27] Leibenstein argues that the magnitude of X-efficiency is greater in monopolistic firms like regulated firms. Due to a lack of competitive pressure in monopolistic firms, they have a lower motivation level than competitive firms.[28]

Since the introduction of X-efficiency theory, a number of students of regulatory economics and policy have recognized its significance in regulated industry and have provided more reasons for its existence. Baumol and Klevorick raised the possibility that X-inefficiency under ROR regulation keeps inefficient firms in operation by passing the excess costs on to their customers and that the ROR constraint which rules out profits in excess of some predetermined rate precludes any financial reward for efficiency and innovation.[29] Cross in his proposal of an incentive scheme suggests the following sources of X-efficiency: "lax management, outdated production methods, sloppy cost-control procedures."[30]

Empirical evidence of the effect of competitive pressure on X-efficiency was found in the electric utility industry when Stevenson (1982), using the translog cost function model, examined data for 1970 and 1972 consisting of electric utilities which own gas distribution utilities and those that do not. The former held monopolistic power within the

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[26] H. Leibenstein, "Allocative Efficiency vs. 'X-Efficiency,'" *American Economic Review* 56 (1966): 412.
[27] H. Leibenstein, "Competition and X-efficiency: Reply," *Journal of Political Economy* 81 (May/June 1973): 767.
[28] Leibenstein, "Aspects of the X-efficiency Theory of the Firm."
[29] W. Baumol and A. Klevorick, "Input Choices and Rate of Return Regulation: An Overview of the Discussion," *Bell Journal of Economics* 1 (Autumn 1970): 189.
[30] J. Cross, "Incentive Pricing and Utility Regulation," *Quarterly Journal of Economics* 84 (May 1970): 237.

service areas, while the latter competed with gas distribution utilities for water and space heating. Stevenson reported that on average competition would reduce costs for the generation of electricity by 6.1 percent for 1970 and 8.5 percent for 1972. Therefore, he advocates regulatory policy reform which allows new entry and increases interfirm rivalry.

Regulation and Cost Efficiency

Cost inefficiency may not occur if producers are simple price takers in a perfect factor market. However, in the regulated industry certain factor prices are often determined through negotiations with labor unions and capital equipment suppliers. In this negotiation process, regulated firms are said to negotiate with lassitude because of the cost-plus nature of ROR regulation. The ROR regulation framework is supposed to include only "allowed" operating expenses and "used and useful" capital. However, the framework is not working well to control costs. This may result from the ex-post decision on the firm's revenue requirement after the firm incurred costs. Williamson's and Westfield's arguments elaborate this case.

Williamson's Expense Preference Model

Williamson argues that the absence of competition and the separation of ownership from management lead firms to seek some objectives other than profit maximization.[31] These firms also have more decision making flexibility about resource allocation than competitive firms. The exercise of such discretion by the firm's managers is likely to reflect their preference, especially for the firm's expenses. Williamson believes that the managers have "positive" expense preferences for staff, emoluments-discretionary funds for salary and perquisites, and profits. The managers behave to maximize the utility function consisting of these elements.

[31] O. Williamson, "Managerial Discretion and Business Behavior," *American Economic Review* 54 (December 1964): 1032-1057.

Moreover, in the case of regulated firms, this model is further modified. The regulatory commissions usually review utility rates periodically when they consider that the rates are unreasonably high or low. Therefore, regulated firms as a strategy may choose not to pursue super normal profits which may lead to a rate review by the commissions. The firms have the incentive to hold profits "at or below some 'safe' level" which does not arouse the regulatory commissions' attention. Assuming that such conditions bind the firm's behavior, Williamson shows that the regulated firms are motivated to expand staff and emoluments to keep the "safe" level of profits. That is, it is possible that managers of regulated firms not only may hire unnecessary staff but also may pay excessive salaries, especially to themselves.[32] Such managerial behavior, which keeps unnecessary labor forces, will cause price inefficiency by deviating from cost minimizing resource allocation, and possibly adverse A-J effects, while the overpayment will result in cost inefficiency.

Crew and Kleindorfer, while asserting that too much attention has been given to the examination of the A-J effect, emphasize the significance of managerial discretion in the theory of regulation.[33] They believe that "[g]iven the monopoly cushion present in most regulated industries, there is greater opportunity in the regulated sector for indulging in discretionary expenditures and managerial emoluments." Using the Williamson expense preference model with some extensions, they show that as the regulatory constraint on profit is tighter the expense-preferring firm further favors its preference for staff expenditures. In addition, incorporating the A-J effect in the model, they illustrate that for the expense-preferring firm, regulation is likely to replace the A-J type inefficiency of overcapitalization by inefficiency of staff expenditures.

Regarding the validity of the Williamson model in the electric utility industry, Awh and Primeaux first attempted to test for it.[34] Using municipally owned electric utility firms facing competition and their

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[32] O. Williamson, *Economics of Discretionary Behavior: Managerial Incentives in the Theory of the Firm* (Chicago: Markham, 1968), 55-59.
[33] M. Crew and P. R. Kleindorfer, "Managerial Discretion and Public Utility Regulation," *Southern Economic Journal* 45 (1979): 696-709.
[34] R. Awh and W. Primeaux, Jr., "Managerial Discretion and Expense Preference Behavior," *Review of Economics and Statistics* 67 (1985): 224-231.

matching monopoly firms, they obtained a result, quite contrary to the Williamson expense preference model, that administrative and sales expenses were lower for the monopoly firms than the duopoly firms facing competition.

Westfield's Regulation and Conspiracy

Westfield throws light on another source of cost inefficiency which exists in regulated firms: price conspiracies between the regulated firms and capital goods manufacturers. He argued "(1) that it can be in the interest of the regulated private power generating company to pay a higher rather than a lower price for the plant and equipment it purchases, and (2) that in other instances, though not benefited, the regulated utility is not at all harmed by the inflated prices that result from conspiracies."[35] This theory may be explained by introducing the cost of capital acquisition per unit (assumed to equal one by Averch and Johnson) in the ROR regulation framework. That is, resource waste may be caused either by an increase in the units of capital used and/or rate base padding by the higher acquisition costs of capital. The latter represents cost inefficiency, while the former effect is similar to the A-J effect.

In addition, Emery postulated that equipment manufacturers' conspiracy would depend upon the methods of rate base valuation, that is, actual cost vs. reproduction cost methods.[36] He demonstrated that the regulatory process with some form of reproduction cost valuation might encourage utilities to cooperate or acquiesce to conspiratorially higher prices. Empirically, he compared the acquisition prices for steam electric generation units subject to the types of rate base valuation methods between a "conspiracy" period, 1956-59, and the adjacent periods, 1954-55 and 1960-61. For the "conspiracy" period, the "agreements" of the so-

[35] F. Westfield, "Regulation and Conspiracy," *American Economic Review* 55 (1965): 424.

[36] E. Emery, "Regulated Utilities and Equipment Manufacturers' Conspiracies in the Electric Power Industry," *Bell Journal of Economics* 4 (1973): 322-337.

called "sales" of equipment were supposedly effective. The findings were that utilities paid significantly higher prices during the "conspiracy" period than during the other adjacent periods: acquisition prices subject to actual cost valuation were approximately 6 percent higher, but the difference was not statistically significant, while those subject to reproduction cost valuations were 15 percent higher and the difference was statistically significant.

Regulation and Technological Efficiency

The main responsibility of regulatory commissions has been to get utility firms to provide adequate service at reasonable prices. The implementation of this regulatory responsibility, such as decisions on rates of return, encouraging or prohibiting of market entry of a new firm, and the interval of rate reviews, affects the regulated firms' research and development (R&D) efforts and thus the pace of technological change in the regulated industry.[37] One policy issue is whether such regulatory activities encourage or retard technological progress. To investigate this question, research in this field largely focuses on the relations of firm size to R&D investments and inventions which are used as proxies for technological progress.

It has long been argued that because of the existence of scale economies in the regulated utility industry, a single large firm can produce public services at lower prices than several small firms. The first question is whether such a large firm has a better position for R&D or whether any relationship between these two factors exists. Those who advocate the advantageous position of large firms for R&D count on the large firms' cash liquidity. Large firms are considered to have it easier attracting the cash used for R&D investment. In addition, R&D costs may be spread over all the products of the firms as a fixed cost, and thus the

[37] Regulatory decisions may also influence the pattern of technological change such as the intensity of input and the elasticity of factor substitution (Christensen and Greene, 1976). However, in this section the primary concern is the progress of efficiency rather than the change in the technological pattern over time.

impact of any financial loss from a R&D failure may be minimized. Moreover, communications among R&D, marketing, and financing departments about their relevant information may increase the probability of R&D success.[38] Wilder and Stansell, using data from privately owned electric utilities for the years 1968 through 1970, showed that even within regulated industry R&D expenditures increased with firm size.[39]

On the other hand, Harberg's research, which sorts seventy major inventions since 1880 according to the contributors, showed that more than 54 percent (38 out of 70) were invented by individuals and that about 34 percent (24 out of 70) were attributed to industrial research laboratories. Even in this research laboratory category, many belonged to small, not large firms. Harberg held that the source of technological inefficiency in large firms or R&D institutions is their relatively bureaucratic and less creative atmosphere.[40]

In addition, regulatory commissions are supposed to allow revenues to recover costs, but prevent utilities from earning monopoly profits. This regulatory role has two contrary implications: first, regulated firms are relatively risk free to the investments for R&D and are encouraged to introduce new technology, and, second, the regulated firms lose the opportunity to earn high monopoly profits, Schumpeter argued, which give them incentives to take high risks for R&D success. As long as a firm's R&D expenditures may be included in revenue requirement calculations, the regulated firms will show an eagerness to undertake risky R&D. On the other hand, if the firms are denied extraordinary profits which might result from the successful introduction of new production or cost saving technology, the firms' innovative activities will be discouraged.[41]

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[38] D. Mowery, "Market Structure and Innovation," *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth* (Greenwich, Connecticut: JAI Press Inc., 1986), 92.

[39] R. Wilder and S. Stansell, "Determinants of Research and Development Activity by Electric Utilities," *Bell Journal of Economics* 5 (1974): 646-650.

[40] D. Harberg, "Invention in the Industrial Research Laboratory," *Journal of Political Economy* 75 (April 1963): 95-115.

[41] W. Capron, *Technological Change in Regulated Industries* (Washington, D.C.: The Brookings Institution, 1971), 8-9.

Barriers to entry into the industry may also have an adverse effect on technological progress. The regulated firms are given a franchise to provide services exclusively within their geographical boundaries. Therefore, the firm is rarely threatened by the possible entry of new firms based on new cost reducing technology.[42] The lack of pressure on the firms' positions established in the market is unlikely to induce vigorous innovative activities. The regulatory process of restraints on market entry is biased in maintaining the status quo and avoiding high-risk, high-cost R&D.[43] Moreover, barriers to entry not only retard the incumbent firm's involvement in innovative activity, but also foreclose potential entry firms development of new technologies.[44]

Stevenson tested for the effects of competitive pressure on technological progress in terms of cost savings between the years 1964 and 1972.[45] The likelihood test for the models with the presence of competitive pressure and its absence led to rejection of the hypothesis that competitive pressure does not affect technological progress. Stevenson reports that at the sample mean a firm supplying both gas and electric utilities is estimated to make a lower rate of technological progress by 4.1 percentage points than the electric utility firm, which does not provide gas service and thus faces competition with gas utilities.[46]

Finally, intensive debates have been underway about the effects of regulatory lag on the innovative activities of the regulated firms. Under ROR regulation, once a utility price is set by a regulatory commission, the regulated firm is responsible for any losses or gains until the commission's next rate decision. The firm has the chance to earn high profits during the interval of price adjustments if it reduces costs by

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[42] The advent of cogenerators and small power producers, which make more efficient use of fuels, under PURPA is believed to encourage technological advancement in existing electric utilities.

[43] W. M. Capron, *Technological Change in Regulated Industries*, 9-10.

[44] R. Ekelund, Jr. and R. Higgins, "Capital Fixity, Innovations, and Long-Term Contracting: An Intertemporal Economic Theory of Regulation," *American Economic Review* 72 (March 1982): 32-46.

[45] R. Stevenson, "X-Inefficiency and Interfirm Rivalry: Evidence from the Electric Utility Industry," *Land Economics* 58 (February 1982): 52-66.

[46] Ibid., 61-63.

adopting new technology. Therefore, the regulatory lag can play an instrumental role in promoting the firm's innovative activity. Bailey, using regulatory lag as a determinant in her model assuming price to be equal to average cost, concluded that as regulatory lag lengthens the firm increases its level of innovative activity.[47] On the other hand, Sweeney, using the model requiring price to be set at the average cost incurred in the previous period plus a markup, illustrated that the regulated company can maximize profits by retarding the speed at which it adopts cost saving technological change. He added that the firm's incentives for adopting innovations depend upon the regulatory constraint (the size of the markup), the nature of the demand function, and the regulatory lag. The model assumes that firm behavior is determined by the regulatory commission's decisions.[48] However, the firm's actual or expected reactions may also influence regulatory decisions.[49] Therefore, the relationship between these two parties is more likely to be reciprocal than unilateral and deterministic.

Regulation and Allocative Efficiency

Neoclassical economic theory informs that allocative efficiency, that is a socially optimal production level, is met only by marginal-cost pricing. However, in the presence of decreasing average costs in the utility industry, price is to be charged at average cost to cover all costs of production. Consequently, regulation results in a higher price because of the revenue constraint and a lower level of utility output than marginal-cost pricing.

Political influence also affects economic considerations of efficiency. Political influence includes the effects of special interest

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[47] E. Bailey, "Innovation and Regulation," *Journal of Public Economics* 3 (1974): 285-295.

[48] G. Sweeney, "Adoption of Cost-Saving Innovations by a Regulated Firm," *American Economic Review* 71 (1981): 437-447.

[49] G. Sweeney, "Adoption of Cost-Saving Innovations by a Regulated Firm," *American Economic Review* 71 (1981): 437-447. Also Williamson's Preference Model (1964) implicitly assumes such an interactive relation between firms and regulators.

groups on regulatory decisions and policy makers' distributional considerations in utility pricing. These political factors often underweigh the economic efficiency goal and cause subsidy problems among the customer classes. Led by Stigler,[50] a group of free market economists has argued that regulatory decisions are biased in favor of groups with influences in the decision process, that is, regulated industries. Employing this special interest theory, other economists have written of the distributional questions among customer classes. Jordan summarized the arguments of Stigler and Friedland,[51] Jackson,[52] and Moore[53] that "taken together, these three studies indicate that regulation has had a limited effect on lowering electric utility rates, and that most of its benefits have been enjoyed by commercial and industrial customers rather than the more numerous residential customers."[54]

Primeaux and Nelson empirically examined the subsidy issue by comparing the ratios of price to marginal cost across customer classes.[55] They reported that the rate structure of private electric utilities discriminates in favor of industrial users relative to commercial and residential users, who are treated equally. On the other hand, Wenders obtained an opposite result.[56] His method was to compare the percentages of actual class revenues to the utility's total revenue requirements under present prices with the percentages of would-be class revenues to total revenues under marginal-cost pricing. Then he calculated the ratio of actual class revenues to those that would be collected under marginal-cost pricing as a percentage term. These values were 82.8, 111.5, and 112.0

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[50] G. Stigler, "The Theory of Economic Regulation," *Bell Journal of Economics* 2 (1971): 3-21.

[51] G. Stigler and C. Friedland, "What Can the Regulators Regulate? The Case of Electricity," *Journal of Law and Economics* 5 (1962): 1-16.

[52] R. Jackson, "Regulation and Electric Utility Rate Levels," *Land Economics* 45 (1969): 372-376.

[53] T. Moore, "The Effectiveness of Regulation on Electric Utility Prices," *Southern Economic Journal* 36 (1970): 365-375.

[54] W. Jordan, "Producer Protection, Prior Market Structure, and the Effects of Government Regulation," *Journal of Law and Economics* 15 (1972): 156.

[55] W. Primeaux, Jr. and and R. Nelson, "An Examination of Price Discrimination and Internal Subsidization by Electric Utilities," *Southern Economic Journal* 47 (July 1980): 84-99.

[56] J. Wendel, "Firm-regulator Interaction with Respect to Firm Cost Reduction Activities," *Bell Journal of Economics* 7 (1976): 631-640.

percent for the residential, commercial, and industrial classes, respectively. In other words, residential users were paying lower rates under the existing rate structure than under marginal-cost pricing, and were subsidized by industrial and commercial users. Guldmann, using the 1979 gas distribution plants and sales data over sixty-five communities served by the Iowa Division of Peoples Natural Gas Company, attained similar results.[57] From the assessment of the deviations between distribution marginal costs and actual cost allocations, he found that cross-subsidizations occurred with the residential and large industrial markets as the winners and the commercial and small industrial ones as the losers.

It should be noted that in reality there are many special rates, such as promotional incentive rates, interruptible rates, and lifeline rates, which favor target groups. All raise the distributional question of who gains and who loses. As long as rate-making leads to internal subsidization from one class to another or from one product to another, this practice sends a wrong price signal to the customers, thereby resulting in allocative inefficiency. To address the cross-subsidy problem, the majority of regulatory commissions generally have adopted a fully distributed cost approach as a basis of rate-making. This approach apportions total costs to each customer class or product proportionally to the costs incurred to provide each service. However, a problem arises where costs are shared by several services. There are no methods to assign them to each service on an efficiency basis and the allocations are likely to be arbitrary.[58] Fully distributed cost pricing also does not take into account marginal cost in its cost calculation and thus cannot guarantee any improvement of allocative efficiency. Several pricing mechanisms, often referred to as second-best or Ramsey pricing, have been suggested to

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[57] J. Guldmann, "Capacity Cost Allocation in the Provision of Urban Public Services: the Case of Gas Distribution," *Growth and Change* 20 (Spring 1989): 1-18.

[58] S. Berg and J. Tschirhart, *Natural Monopoly Regulation: Principles and Practice* (Cambridge: Cambridge University Press, 1988).

maximize economic welfare subject to revenue requirement constraint. However, they are only occasionally being used.

Conclusion

This chapter has reviewed the concepts of efficiency and regulatory effects on firm behavior. The review shows that both theoretical arguments and empirical findings do not definitively provide a clear answer regarding the presence, magnitude, or type of inefficiency resulting from current practices of regulation. Still it is believed that regulation does not currently give utility firms incentives for efficient operations, and the result is varying degrees of inefficiency.

CHAPTER 4

EVALUATION CRITERIA

Chapter 3 has discussed theoretical and empirical evidence regarding efficiency issues resulting from the basic concept and operation of ROR regulation. This information provides the foundation for advancing various policy claims; that is, policy alternatives to ROR regulation. In the argument model, this move from the given information to the policy claims requires a reasoned statement of "how advocates infer a specific claim from the information." This statement is called a warrant, and authorizes the transformation of information into the policy claim.

Warrants take various forms including mathematical formulas, legal provisions, empirical generalizations, and ethical principles, depending upon the field of argument; for example, natural science, law, and medicine. While attempting to establish an argument form in the field of regulatory policy making, this study uses the objectives of regulation as standard warrants. That is, these objectives are used as the criteria for evaluating alternatives to ROR regulation.

Efficiency and equity are the most commonly mentioned regulatory objectives in public utility discussions. Most previous studies of policy alternatives have adopted efficiency as a primary evaluation criterion for, or reason given to, a policy claim. The use of this single efficiency criterion may make it easy to reach the claim without value commitment of equity. However, as MacRae argues,

> A frequent error in the public's policy discourse is to use only one criterion when others need to be added to allow a more balanced assessment of alternatives. . . . More generally, this error involves the selection for particular arguments of some, but not all, of the valuative criteria

needed for choice. When committed, it fails to assure the completeness of the structure of reasoning advanced.[59]

Therefore, this chapter attempts to develop multiple evaluation criteria drawn from both efficiency and equity considerations.

Even though a claim for an alternative to ROR regulation is warranted by these regulatory objectives, there may be exceptional situations, so-called rebuttals, in which the warrants are undermined. Since regulatory alternatives deal with a future policy option, they are accompanied with conditional assumptions accounting for uncertainty.[60] These conditions pertaining to the regulatory alternatives are mostly related to their implementation. For example, the assumptions of deregulation alternatives include the market structures in which the alternatives are implemented. Therefore, implementability is used as an additional criterion for evaluating the policy alternatives to ROR regulation. This chapter first introduces evaluation criteria drawn from the regulatory objectives and moves to the development of implementability criteria.

Objective-Driven Evaluation Criteria

Public policy is characterized by its "purposive" action.[61] Public policy has some underlying values and norms which are anticipated to be achieved. These values and norms are more often known as policy objectives.[62] When alternatives to an existing policy are under

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[59] D. MacRae, Jr., "Professional Knowledge for Policy Discourse: Argumentation versus Reasoned Selection of Proposals," *Knowledge in Society* 1 (Fall 1988): 14.

[60] H. Goldstein, "Planning as Argumentation," *Environmental and Planning B: Planning and Design* 11 (1984): 297-312.

[61] J. Anderson, *Public Policy-Making*, 2nd ed. (New York: Hold, Rinehart and Winston, 1979).

[62] R. L. Keeney and H. Raiffa, *Decisions with Multiple Objectives* (New York: John Wiley & Sons, 1976), 34, define an objective as a "'direction' in which we should strive to do better" and a goal as a specific "level of achievement to strive toward." Following their definition, this dissertation prefers using objectives to goals to represent general norms which public policy pursues.

consideration, they shall satisfy the same objectives that the existing policy has pursued unless the original objectives are replaced by others. In addition, the attainability of the objectives is closely related to their implementability in practice as well as their theoretical and conceptual features. That is, the alternatives should not only be theoretically sound to reach the objectives but also should meet certain conditions under which they are carried out. For instance, the typical view of regulation regards government intervention in public utilities as protecting customers from the potential abuses of natural monopoly. In this case, alternatives can be assessed based on the degree to which they are able to achieve the objective "the protection of customers." Moreover, the implementability of any alternative depends upon real market structures of the regulated industry, which has been assumed to be a "natural monopoly."

The objectives of utility regulation may be obtained from the theories of regulation which explain why government regulation of utilities has arisen. Bonbright, Danielsen, and Kamerschen classify the theories into normative and positive approaches, based on their methodological orientation toward regulation.[63] The normative approach represented by public interest theory views the world as it ought to be, while the positive perspective focuses on the world as it has evolved or as it is. Private or group interest theory, together with its variants,[64] and transactions cost theory take the positive stance.

The public interest theory regards the basic objective of regulation as the promotion of "the public interest." On the other hand, the private or group interest theory, based on the observation of the historical behavior of regulatory agencies, argues that the regulatory objective is related to the protection of private interests; that is, those of producers and bureaucrats. From the perspective of private interest theory,

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[63] J. Bonbright, A. Danielsen, and D. Kamerschen, *Principles of Public Utility Rates*, 2nd ed. (Arlington, Virginia: Public Utilities Reports, Inc., 1988).

[64] Bonbright, Danielsen, and Kamerschen provide a succinct review of several alternative explanations of regulation. They are rent seeking, public choice theory, industry capture theory, regulation as taxation, governmental habit, and bureaucracy theory.

regulatory activities such as rate-making and barriers to entry are favorable to the producers, who have more access to and influence over regulators. Therefore, advocates of the private interest theory argue for leaving the utilities free from government regulation. The underlying assumption behind this position is that deregulation or competition will serve to enhance social welfare, that is, "economic efficiency."

Another positive approach by Williamson seeks regulatory objective by minimizing transaction costs. Williamson's transaction cost theory regards regulation under the monopoly condition as a preferred governance structure in the context of efficiency to alternative modes of governance such as franchise bidding and other deregulation alternatives, which are mostly proposed by private interest theorists.[65] That is, the regulatory objective from the transaction cost perspective is also considered to attain "efficiency," which contains much broader dimensions than economic efficiency. Both private interest and transaction cost theories also implicitly seek an objective, "efficiency."

Moreover, the efficiency objective does not conflict with the public interest objective, since efficiency is often incorporated within the public interest. That is, both normative and positive approaches explicitly or implicitly presume that the principal regulatory objective is to pursue "the public interest." Therefore, this objective is suggested for use as a criterion to evaluate alternatives to ROR regulation. The next question is about the concept of the public interest.

Proxy attributes associated with efficiency can be established from the previous review of the concepts of efficiency and transaction cost theory. In chapter 3, the current ROR regulation scheme is argued to be the cause of inefficiency in production, cost, and social welfare aspects. The main causes for inefficiency are associated with the cost-plus nature, lack of competitive pressure, and deviations from marginal-cost pricing. In other words, ROR regulation neither rewards efficiency nor penalizes inefficiency, and thus does not provide utilities with incentives for efficient management. Moreover, since the utilities are franchised and no

[65] O. Williamson, "Franchise Bidding for Natural Monopolies in General and with Respect to CATV," *Bell Journal of Economics* 22 (Spring 1976): 73-104.

other businesses may provide the same service in the same territory, they are isolated from outside threats of price competition or market entry. Finally, political or equity considerations often have justified cross-subsidies among the different classes of customers, which result in deviations from marginal-cost pricing thereby sending wrong price signals to the customers. Alternative schemes, therefore, should be designed to address these causes. The following factors will be included in the efficiency evaluation criteria.

- To what degree does an alternative provide an incentive to reduce costs and increase profits?
- To what degree does an alternative impose competitive pressures on utilities?
- To what degree does an alternative eliminate cross-subsidies and promote marginal-cost pricing?

Another efficiency criterion may be obtained from transaction cost theory. Transactions cost refers to the "direct and indirect costs of operating the regulatory scheme, as well as costs arising from X-inefficiency, allocative . . . effects and the like."[66] Some notable transactions include those between utilities and factor input suppliers, within utilities, between utilities and their customers, and between utilities and regulators. The efficiency effects of governing the first three transactions are covered by the above three efficiency criteria. The additional efficiency criterion focuses on costs associated with the utility-regulator transactions. Under current ROR regulation, these transaction costs include operating costs of regulatory agencies and utilities' compliance costs with regulation. These costs, which occur during the implementation of an alternative, will increase as regulatory burdens incurred by regulatory agencies and utilities increase. Thus, the relevant efficiency evaluation criterion is

- To what degree does an alternative reduce or increase current regulatory burdens under ROR regulation, or create new regulatory burdens?

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[66] M. Crew and P. Kleindorfer, *The Economics of Public Utility Regulation* (Cambridge, Massachusetts: The MIT Press, 1986), 150.

The efficiency objective has been justified by the compensation principle that as long as net benefits are greater than zero the gainers could compensate the losers. This principle does not require that the gainers actually compensate the losers, and thus does not deal with the distributive aspects of an alternative.[67] On the other hand, equity considers distributive effects of the alternatives on individual customers or groups. Many philosophers and economists have been concerned with distributive justice.[68] While this extensive literature has tremendous intuitive appeal, it remains largely unimplementable because of the difficulty in devising compensation mechanisms that are equitable and efficient. Therefore, only those factors that clearly worsen the current equity level under ROR regulation are taken into account. Keeley advocates this approach, labeling a "regret" or "suffering" minimization principle, as pragmatic and operationalizable.[69] Keeley further states that "minimization of regret or suffering is not only a greater moral urgency than the promotion of happiness, but less dependent on individual tastes that come into play once basic needs are met."[70]

Based on the regret minimization principle, the equity evaluation criteria are suggested to meet the following conditions: (1) an alternative should not result in any serious regret to the customers, especially to low-income customers; (2) anyone who suffers due to the adoption of the alternative should be provided with sufficient opportunities to express his or her complaints. Regarding the first condition, the effects of the alternative on price and service quality play a major role in affecting customers' regret levels. Price increases will bring about more serious regrets to low-income customers, since the marginal value of a dollar is worth more to them. Moreover, price increases may result in cutting the provision of service to those who cannot afford to pay for it. Degradation

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[67] E. Gramlich, *Benefit-Cost Analysis of Government Programs* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1981).

[68] J. Rawls, *A Theory of Justice* (Cambridge, Massachusetts: The Belknap Press, 1971); R. Nozick, *Anarchy, State, and Utopia* (New York: Basic Books, Inc., 1974); and A. Okun, *Equality and Efficiency: The Big Tradeoff* (Washington, D.C.: Brookings Institution, 1975).

[69] M. Keeley, "Social-Justice Approach to Organizational Evaluation," *Administrative Science Quarterly* 23 (June 1978): 272-292.

[70] Ibid., 286.

of service quality--such as more frequent power outages and higher noise levels in telephone communications--will also cause regret to customers, perhaps more importantly to high-volume customers. The second condition requires that once customers suffer from price increases, degradation of service quality, or other service provisions, they should be given opportunities to reduce or remedy their sufferings. In sum, the specific factors to be considered as equity evaluation criteria are as follows:

- To what degree would an alternative increase utility prices?
- To what degree would an alternative lead to degradation of service quality?
- To what degree would those customers who suffer due to these or other factors have chances to express their opinions and get their complaints redressed?

Implementability Evaluation Criteria

Implementability criteria may be different according to the types of alternatives to ROR regulation. In this study, the alternatives are divided based on the similarity of their underlying ideas into deregulation and incentive regulation. Deregulation relies upon interfirm competitiveness to achieve efficiency by allowing market entry and/or reduced government intervention in price and revenue decisions. Incentive regulation relies upon internally or externally imposed monetary rewards or penalties mostly to improve X-inefficiency. Therefore, the success of deregulation mainly depends upon how competitive a market is. In other words, the same alternative will be valued differently in the electricity, telecommunications, and gas industry markets, which face different levels of competition. In addition, the success of incentive regulation depends on how well the incentive formulas motivate managers to perform better. Formulas should be designed to induce incentives for efficiency, and data required for the formulas must be obtainable. The degree to which both incentive regulation and deregulation alternatives attain the above objectives very much depend upon their implementability.

Implementability Conditions of Incentive Regulation Alternatives

Incentive regulation introduce some kinds of formulas which can generate implicit or explicit rewards or penalties. For these formulas to compensate correctly for performance and to motivate better performance, they should be theoretically sound and data must be available and accessible.

Theoretically, the formulas first should reflect dynamic changes in the general economy. If the formulas are insensitive to absorbing external economic changes, the utilities are likely to face unreasonable profit losses or gains. In addition, penalties and rewards resulting from a firm's performance should have a direct impact on the firm's future performance. To this end, they should be fair, objective, and closely related to the firm's current management. Any arbitrary factors beyond the scope of managerial control should be eliminated from the formulas used in incentive regulation programs. Third, measurement formulas must include all possible elements, which affect overall performance of a firm. Otherwise, the firm has incentives to misallocate resources to increase target performance criteria at the cost of other performance considerations, thereby hampering allocative efficiency.

Another condition is associated with data. For the incentive schemes to be implementable adequate, accurate, and timely data should be available and accessible. The variables employed in the incentive alternatives should also be quantifiable. In sum, the implementability conditions which should be met by the incentive regulation models are as follows:

- To what degree is an incentive regulation alternative sensitive to reflect external economic changes?
- To what degree is management directly affected by imposed penalties or rewards and thus does an alternative promotes improvement of a firm's performance?
- To what degree does an alternative employ multiple criteria in the performance measurement formula and thus discourages the distortion of resource use?
- To what degree are appropriate data available and variables are quantifiable?

Implementability Conditions of Deregulation Alternatives

Historically, the market structures of public utilities have provided economic rationales for government regulation. Public utilities are often referred to as natural monopolies, which traditionally have been defined by economies of scale. In addition, they are further characterized by large fixed and nonliquid capital investments, and technical limitations of building infrastructures under, upon, or over public property.[71] In a market where these characteristics still exist, a general consensus prevails that competition is not feasible and uncontrolled monopolies are potentially dangerous both in terms of efficiency and equity.

However, in this market, ROR regulation is not the only way of providing service. Public ownership or joint public-private ownership are popularly employed in Europe and Asia. In the United States, meanwhile, alternate methods for utility service are directed toward removing government intervention and leaving the provision of service in market functions. In such a circumstance, policy makers' views on utility market structures directly affect the evaluation of the implementability of the alternatives. For example, when the utility market is fairly competitive and technical limitations do not exist, complete deregulation may maximize efficiency even though its equity effects are yet to be investigated. On the other hand, when the market is still naturally monopolistic and has technical limitations, the complete deregulation option may be less feasible since both aspects of efficiency and equity will also be poorly rated.

Among the factors that have been considered as special features of the utility market structure, natural monopoly, asset specificity, and technical limitations play a key role in determining the implementability of policy alternatives to ROR regulation.

Traditional natural monopoly theory holds the view that firms with economies of scale are natural monopolies. However, this view has been questioned. Many economists now argue that economies of scale are neither

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[71] C. Phillips, Jr., *The Regulation of Public Utilities: Theory and Practice* (Arlington, Virginia: Public Utilities Reports, Inc., 1985), 38-46.

a necessary nor a sufficient condition for a natural monopoly. The mere existence of economies of scale in a utility does not lead to the conclusion that competition is infeasible and that some form of control should be imposed on the utility. Baumol uses the notion of subadditivity of costs as a proper condition for natural monopoly.[72] In a single product case, subadditivity means that a single firm produces a product more cheaply than two or more firms divide the amount of the product. In other words, as long as a firm's costs are less than the combined costs incurred by several firms sharing the production of the same products, the firm is treated as a natural monopoly even in the case of diseconomies of scale.

In figure 4-1 the single product firm faces increasing average costs beyond output level y_2. Provided no combination of divided output produced by several firms can reduce price to below P_{AC}, the single product firm is still considered a natural monopoly with demand curve D_3. Berg and Tschirhart call this case where marginal-cost pricing does not result in negative profits and the cost function is still subadditive[73], "weak natural monopoly," while they call the case in which marginal cost is lower than average cost and marginal-cost pricing causes deficits, "strong natural monopoly."[74]

The subadditivity condition for a multiproduct natural monopoly means that the joint production of output vectors by a single firm yields costs less than their separate production by two or more firms. Here, the separate production means any combination of the production amounts of the output vectors. That is, subadditivity encompasses economies of scope, which is the special case that each output vector has only one positive

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[72] W. Baumol, "On the Proper Tests for Natural Monopoly in a Multiproduct Industry," *American Economic Review* 67 (December 1977): 809-822.

[73] As seen in figure 4-1, marginal-cost pricing in the natural monopoly is feasible without a subsidy. In addition, a firm's monopoly position not only depends on the firm's cost function but also upon a demand schedule. As demand grows, while the cost function being held constant, the firm's natural monopoly position will get weaker. See also M. Waterson, *Regulation of the Firm and Natural Monopoly* (New York: Basil Blackwell Ltd., 1988), 18.

[74] S. Berg and J. Tschirhart, *Natural Monopoly Regulation: Principles and Practice* (Cambridge: Cambridge University Press, 1988).

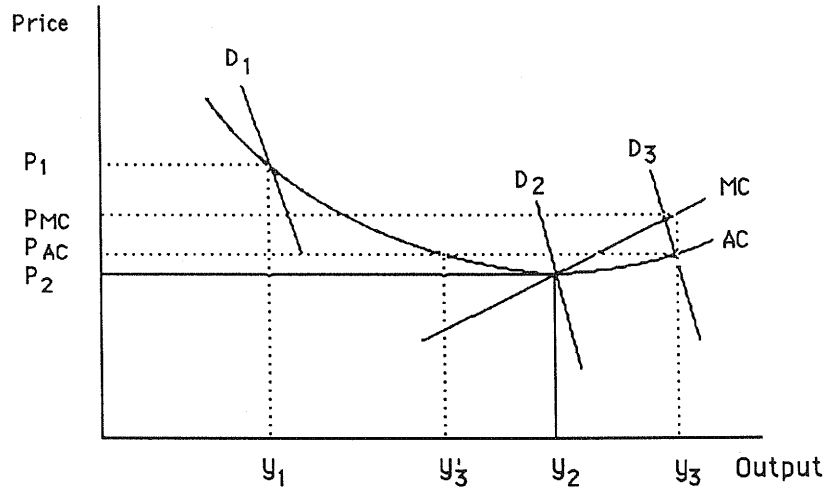

Fig. 4-1. Subadditivity and Sustainability

output. In conventional terms, economies of scope exist when a single firm jointly produces multiple outputs with lower costs than several separate firms can produce each output. Therefore, given subadditivity as a sufficient and necessary condition for natural monopoly, the implications of economies of scope for regulation are much complicated.

The subadditivity literature clearly has contributed to the extension of natural monopoly theory. From the efficiency objective perspective, a utility's natural monopoly stance is to be determined based on the subadditivity condition rather than the simple existence of scale or scope economies. However, even though literature on natural monopoly or subadditivity has made great advancements recently, difficulties still exist on how to test subadditivity empirically in the cost function. Waterson argues that "[i]n discussing the single-product case, . . . subadditivity at the relevant output, . . . was not related in any close way to features of the cost function. The most we can say is that if there are still economies of scale unexploited, the industry is a natural

monopoly."[75] In addition, economies of scope still provide some insights to evaluate policy alternatives which advocate deregulation based on market disintegration; for example, the separation of the generation level from the hierarchically integrated utility structure. Therefore, at the current status of the subadditivity literature, the evaluation criteria will rely upon the traditional natural monopoly theory of economies of scale and scope.

A firm is not yet justified to be regulated simply due to its status as a natural monopoly. Baumol, Panzar, and Willig argue that in a market where entry is free and exit is costless due to little sunk costs, a single firm is forced to operate efficiently and to set prices not to earn supernormal profits even without facing direct competition. They refer to such a market as a "contestable market."[76] Demsetz, advocating franchise bidding, also has argued that a single firm can be designed to provide service without charging monopoly price.[77] In either argument, one important assumption is that the firm's investments are not sunk and are recoverable with its exit from the market. This assumption draws a criticism. Williamson argues that when an asset is highly idiosyncratic or specific to a particular use, investors seek some safeguards to protect their investments. Such a situation requires a special institution which monitors transactions between service providers and customers to secure proper return on the investments and to prevent absurd service interruption.[78] This is his major argument against franchise bidding as proposed by Demsetz. As implied in their argument, asset specificity or sunk costs of investment should be used to evaluate the alternatives.

Moreover, even though a market is contestable, satisfying the basic conditions--including free entry and costless exit--may result in a situation where regulation is desirable. If a firm's price is not "sustainable" from the potential entry, which may cause wasted resources

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[75] M. Waterson, *Regulation of the Firm*, 25.

[76] W. Baumol, J. Panzar, and R. Willig, *Contestable Markets and the Theory of Industry Structure* (New York: Harcourt Brace Jovanovich, 1982).

[77] H. Demsetz, "Why Regulate Utilities," *Journal of Law and Economics* 11 (1968): 55-65.

[78] O. Williamson, "Franchise Bidding for Natural Monopolies in General and with Respect to CATV," *Bell Journal of Economics* 22 (Spring 1976): 73-104.

due to redundant facilities with the existing infrastructure, the restriction on such an entry to avoid destructive competition may be maintained.[79] In figure 4-1, average-cost prices responding to output up to y_2 are sustainable, as long as potential entry firms do not have cost functions superior to the incumbent firm. However, this is not the case of average- or marginal-cost prices beyond the output range y_2. For example, when the incumbent firm with subadditivity of costs set price at between average cost P_{AC} and marginal cost P_{MC}, a potential competitor which has the same cost function as the incumbent firm can provide a share of the total output y_3 at a lower price than P_{AC}, provided the competitor's sales reach more than y_3'. That is, price P_{AC} is not sustainable. If large assets are invested to meet growing demand, the average cost set can be unusually high. Therefore, even within the range of the output level less than y_3, the natural monopoly is not in a sustainable stance against entry,[80] which can lower average cost with less fixed costs. In the multiproduct utility, nonsustainability can also be present due to cross-subsidies, which require that a product's price be set in excess of its stand-alone cost to compensate losses to other lower priced products. The incumbent is vulnerable to the entry of competitors to exploit the higher priced product market.

When a natural monopoly is contestable and sustainable, regulation is unnecessary from the perspective of the efficiency objective. Threats of entry from potential competitors force the natural monopoly to minimize cost. On the other hand, when the natural monopoly is contestable but not sustainable, entry may be restricted and the monopoly also may be regulated either to prevent monopoly prices or to enforce marginal-cost pricing (Berg and Tschirhart, 1988).

Despite the theoretical appeal of this argument, there exists a difficulty in "determining *ex ante* whether or not a given demand and cost

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[79] W. Baumol, E. Bailey, and R. Willig, "Weak Invisible Hand Theorems on the Sustainability of Natural Monopoly," *American Economic Review* 67 (June 1977): 350-365; and J. Panzar and R. Willig, "Free Entry and Sustainability of Natural Monopoly," *Bell Journal of Economics* 8 (Spring 1977): 1-22.

[80] J. Bonbright, A. Danielsen, and D. Kamerschen, *Principles of Public Utility Rates*, 2nd ed. (Arlington, Virginia: Public Utilities Reports, Inc., 1988).

structure represents a sustainable monopoly."[81] Moreover, as demands change over time (that is D_1, D_2, and D_3 in figure 4-1) sustainability also changes.[82] Thus, the sustainability theory is yet to be further developed to provide specific information for evaluating policy alternatives. Therefore, rather than examine whether current utility prices attract a competitor's entry, evaluation will be based on whether there exists technology which prevents destructive and uneconomical competition because of the redundant infrastructure within the incumbent utility.

To summarize, the factors of market structure to be considered as implementability criteria are as follows:

- To what degree do economies of scale and/or economies of scope exist in the target utility industry?
- To what degree are the assets invested in the utility specific or sunk?
- To what degree is technology available to provide the same service in the same area without structural redundancy?

Conclusion

This chapter has attempted to establish a comprehensive set of evaluation criteria for policy alternatives to ROR regulation. Linked to the elements of the argument model, the evaluation criteria are associated with warrants and rebuttals. In this study, the efficiency and equity objectives of utility regulation are regarded as the warrants, which justify a policy claim of an alternate regulation scheme, while the implementability conditions of the alternative are considered as the rebuttals, which alleviate support to the claim.

Moreover, the warrants may not be self-validating and the claim may require additional reasoning--so-called "backing." Backings may include scientific experience, ethical norms, traditions in the field, precedents,

[81] M. Crew and P. Kleindorfer, *The Economics of Public Utility Regulation* (Cambridge, Massachusetts: The MIT Press, 1986), 22.
[82] W. J. Baumol, E. Bailey, and R. Willig, "Weak Invisible Hand Theorems," 405.

and statutes.[83] With respect to the backing of a regulatory alternative, empirical observations and legality have been implicitly used to reenforce one's claim. For example, deregulation experience in the long-distance telecommunications, airline, and trucking industries is often mentioned to support deregulation in the currently regulated industries. It is also anticipated that any policy change should be legal under current statutes. However, empirical backings were not used as a criterion in this study since few proposed alternatives are carried out, the evaluation of the deregulation of these formerly regulated industries is very much asymmetric, and any finding is not easily generalizable to currently regulated industries. This study also removed the legality of an alternative from the evaluation criterion, since the statutes vary among the states and they can also be amended when a new alternative is adopted. Obviously, if any relevant empirical observation or legality is found, it can be used to provide additional support to the claim.

Finally, it should be noted that the above criteria are exemplary in public utility regulation. Social regulation represented by health, safety, and environmental regulation may have different proxy attributes of the same efficiency and equity objectives. In addition, the final set of criteria which will be used to select the best alternative is supposed to be agreed upon by the participants in the policy-making process.

[83] H. Goldstein, "Planning as Argumentation," *Environmental and Planning B: Planning and Design* 11 (1984): 297-312; and S. Toulmin, *The Uses of Argument* (Cambridge: Cambridge University Press, 1958).

CHAPTER 5

EVALUATION OF ALTERNATIVES AND THEIR IMPLEMENTABILITY

This chapter involves evaluating policy alternatives to ROR regulation. The strengths and weaknesses of the alternatives are reviewed according to the efficiency and equity objective criteria, then their implementability is discussed.

A number of alternative regulatory methods exist, mostly aimed at improving efficiency problems under ROR regulation. Since there is no universally used typology, this chapter, for the purpose of systematic presentation, attempts to classify the alternatives into two broad categories: deregulation and incentive regulation. Their major difference results from the source which induces efficiency improvement; that is, deregulation relies upon competitive forces while incentive regulation relies upon direct or indirect monetary rewards to improve efficiency. Deregulation also involves major changes which abandon all or many of the current regulatory practices, while incentive regulation still maintains the ROR regulation structure with a few exceptions.

Deregulation is further decomposed into complete deregulation and partial deregulation.[84] Complete deregulation represents the total elimination of a regulatory commission's authority to review revenues and prices in the ratemaking process. Partial deregulation removes barriers to market entry and/or allows flexibility in a utility's decision on revenues or utility prices.

Incentive regulation alternatives are also classified into the following: those focusing on marginal-cost pricing, those focusing on average-cost pricing, and those focusing on performance. The first

[84] "Complete" deregulation is often interchangeably used with "full" deregulation, "virtual" deregulation, and "comprehensive" deregulation. The report follows the term "complete" deregulation, and its definition used by P. L. Joskow and R. Schmalensee, *Markets for Power* (Cambridge, Massachusetts: The MIT Press, 1983).

category encompasses those approaches designed to motivate the utility to set prices at marginal cost. The second category includes the traditional ROR regulation coupled with incentives. The third category consists of the incentive schemes which utilize an explicit performance index or descriptive performance report for the rewards or penalties of management.

The following sections define the alternatives in each category and then evaluate their strengths and weaknesses. Since policy alternatives to ROR regulation represent future options for regulatory action, evaluation here represents an *ex ante* concept, meaning it assesses the value of alternatives before they are undertaken. Because of this characteristic, no observed empirical data pertaining to the efficiency and equity effects of the alternatives are available. This is also true when studying the implementability of incentive regulation schemes. Therefore, the values of the alternatives are evaluated mostly based on descriptive arguments. On the other hand, the implementability of deregulation alternatives depends upon the market structures under which they are implemented. Thus, data from the current regulated utilities can be used to analyze the market structures.

Evaluation of Deregulation Alternatives

Deregulation may be understood simply as removing government regulatory intervention in private utility businesses and putting those businesses under market control. However, in the process of moving toward the restoration of market autonomy, a variety of changes have been proposed. Those changes are related to industry structure, regulatory tools, and regulatory organizations.[85] Structural changes most often mean the vertical or horizontal disintegration of the currently integrated industrial structure. Changes in regulatory tools involve an allowance of new market entry and a provision of flexibility in a utility's profit and price decisions. Finally, these structural and regulatory changes lead to organizational changes in the power of regulatory commissions. The

[85] P. L. Joskow and R. Schmalensee, *Markets for Power.*

following classifications of complete and partial deregulation represent different combinations of such structural, regulatory, and organizational change with various emphases.

Complete Deregulation

Complete deregulation involves the total elimination of regulatory constraints without attempting any change in the current industry structure. Consequently, regulatory organizations lose their rationale for existence. The new structure of industry and utility prices will evolve through the operation of market forces and may rely upon antitrust laws for the protection of the public interest.

Examples are in the deregulation of the airline and trucking industries. Demsetz's[86] argument is regarded as close theoretically to this category of deregulation.[87] Demsetz agrees with the conventional economic theory of natural monopoly that one firm produces output more efficiently than multiple firms because of scale economies; however, he rebuts its argument that the firm will charge monopolistic price if left unregulated. Demsetz argues that "[t]o the extent that utility regulation is based on the fear of monopoly price, *merely because one firm will serve each market*, it is not based on any deducible economic theorem."[88] He proposes that bidding competition could replace government regulation. Under this proposal, a franchise would be awarded to the bidder offering the lowest per-unit price to provide services. A franchised firm is free from government regulation. The only government intervention is in selecting the winning bidder.

Evaluation of Complete Deregulation

Complete deregulation of currently regulated industries may result in market structure types ranging from perfect competition to monopoly. Its

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[86] H. Demsetz, "Why Regulate Utilities," *Journal of Law and Economics* 11 (1968): 55-65.

[87] P. L. Joskow and R. Schmalensee, *Markets for Power*.

[88] H. Demsetz, "Why Regulate Utilities," 60 (emphases in original).

subsequent effects on efficiency and equity will also vary. Assuming that sufficient competition exists in the market, complete deregulation may provide utilities with incentives, competitive pressure, and price signals based on marginal-cost pricing. Hence, it will achieve efficiency from all aspects of cost, price, dynamics of time, and transactions cost. On the other hand, complete deregulation's effects on equity may be the worst of all alternatives. The profit maximizing utilities may not render service in areas where their profits are below a break-even point and thus may endanger the utility's universal service concept. Service quality also may be degraded for the sake of increasing price competition.[89] Moreover, since the regulatory agencies and probably other associated consumer protection agencies are supposed to be dismantled, customers will have fewer channels to address their complaints. On price, complete deregulation eliminates cross-subsidies among the customer classes. There also are possibilities that large-use customers bypass the utility system or pay discounted rates using their buying power. Consequently, residential customers could face higher utility rates than those under ROR regulation.

In addition, in a market where no sufficient competitors are present or where competitors are not yet mature to compete with the dominant utility, complete deregulation without any other form of governmental intervention could end market monopolization. It eventually may deteriorate both efficiency and equity status. Therefore, where it is proposed complete deregulation is the most sensitive alternative to market structures.

In fact, under current utility market structure, complete deregulation draws little attention both from practitioners and academicians. However, franchise bidding has been increasingly discussed as an alternative to ROR regulation. Franchise bidding may well be rated on the provision of incentives and competitive forces. Competition may be present at the bidding process. As long as multiple firms apply to a franchise bidding,

[89] In this matter, it should be further investigated how much service quality as well as price contributes to the competition of sales with other competitors.

they should compete to win the bidding. Once a firm is franchised to provide service in a given territory, competitive pressures are no longer present. However, the firm is in charge of any profit gain or loss from its operation. Therefore, the firm will be encouraged to operate efficiently due to the incentives for profit maximization, not due to the presence of competitive forces.

With respect to pricing, franchise bidding is still based on average-cost pricing and thus deviates from efficient marginal-cost pricing.[90] Moreover, franchise bidding suffers from the potentially high transaction costs related to the administration of the bidding process and asset takeover in case of franchise termination. In an analysis of the franchise bidding case in CATV in Oakland, California, Williamson observes that several problems may arise in the process of taking over the idiosyncratic physical plant and equipment of an incumbent franchisee.[91] For instance, asset valuation and litigation and other expenses may take place with a franchisee replacement. He also argues that where human assets are specifically coupled with task idiosyncrasies, the franchisee replacement may cause service interruptions and related malfunctions.

Regarding equity, franchise bidding may be assessed as being less equitable than ROR regulation. Service quality, price, and due process can be secured as the initial bidding condition. A governing body is supposed to monitor a franchisee's compliance with these matters, and the franchisee's proposal for changes in these factors is supposed to be the subject of public debates. However, franchise bidding is likely to have less formal provisions about these matters than ROR regulation.

Partial Deregulation

Partial deregulation represents a variety of incremental changes in the utility structure and regulatory methods of the current ROR system.

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[90] L. Telser, "On the Regulation of Industry: a Note," *Journal of Political Economy* 79 (1969): 937-952.

[91] O. Williamson, "Franchise Bidding for Natural Monopolies in General and with Respect to CATV," *Bell Journal of Economics* 22 (Spring 1976): 73-104.

Structural changes involve the break-up of vertically integrated utilities into separate ownership entities on the basis of different levels or parts of their service, as seen in the AT&T divestiture. For the electric utility firms, the typical deregulation scenario is to reorganize them into independent generating, regional transmission, and local distribution companies. The scenario introduces competition at the generating level while leaving distribution systems regulated. The traditional deregulation scenario would rely upon long-term contracts between competitive generating companies and distributors. In addition, a regulated or government-owned transmission company would play a coordinating role in day-to-day operations of generating plants or electric transmission which the distributors purchase directly from power generators. Another deregulation scenario, often known as the MIT scenario, proposes that the transmission company purchase electricity from generating companies at spot prices varying every five minutes and sell it at a markup to regional distribution companies at uniform rates.[92]

Structural changes often are accompanied by regulatory changes which promote the conditions for the transition of industries from regulated to partially deregulated, and ultimately to completely deregulated industries. Regulatory agencies have liberalized (or proposed to liberalize) entry barriers into the market where the incumbent regulated utilities are the dominant service providers. For instance, competition through the allowance of entry into telephone network services has been accelerated by a series of Federal Communications Commission decisions, including the Above 890 decision,[93] the MCI decision,[94] the Specialized Common Carrier

[92] J. Pace, "Deregulation Electric Generation: An Economist's Perspective," in *Current Issues in Public-Utility Regulation*, ed. A. Danielsen and D. Kamerschen, (Lexington, Massachusetts: Lexington Books, 1983), 277. For detailed scenarios of partial deregulation in the electric utility industry, see P. L. Joskow and R. Schmalensee, *Markets for Power*, chapter 8.

[93] Re Allocation of Microwave Frequencies Above 890 Mc, Docket No. 11866, 27 FCC 359 (1959).

[94] Re Applications of Microwave Communications, Inc., Docket No. 16509, 18 FCC 2d 953 (1969).

decisions,[95] the Computer II decision (1976),[96] and a district court's approval of the "Modification of Final Judgment."[97]

In the electric utility industry, the Public Utilities Regulatory Policy Act of 1978 (PURPA) initiated deregulation of generation without proposing vertical disintegration. It has broadened the definition of power sources, initially as a part of energy conservation policy, to include cogeneration and small power production facilities which utilize alternate energy sources such as thermal energy, windmills, and solar collectors. PURPA requires utilities to purchase the output of such qualifying facilities at rates not exceeding their avoided costs. Former FERC Commissioner Hesse proposed an open and competitive solicitation of power from all sources including both qualifying facilities and independent power producers (nonqualifying facilities).[98] Another possible extension of the law is to increase the size limits for qualifying facilities.[99] The law and its extended proposals have been justified on the basis of their role in reducing utility's high marginal cost for generation during peak demands. In addition, the proposals obviously add momentum for a transition to complete industry deregulation.

In addition to liberalizing market entry policy, regulatory changes include streamlining current ROR regulation. ROR regulation involves two important regulatory decisions: total revenues and utility prices. That is, regulatory commissions first determine a utility's total revenue required to recover its costs for utility service and then set utility prices for the different classes of customers to collect the revenues. The commissions' revenue regulation mainly proposes to prevent the utility from earning monopoly profits, while their price regulation seeks to prevent

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[95] Re Specialized Common Carrier Services, Docket No. 18920, Notice of Inquiry, 24 FCC 2d 318 (1970), First Report and Order, 29 FCC 2d 870 (1971).

[96] Re Amendment of Section 64.702 of the Commission's Rules and Regulations, Docket No. 20828, Notice of Inquiry and Proposed Rulemaking, 61 FCC 2d 103 (1976).

[97] Resource Consulting Group, Inc., *Final Report: Incentive Regulation in the Electric Utility Industry: Volume 1* (Washington, D.C.: Federal Energy Regulatory Commission, September 1983).

[98] Cited in R. Haman-Guild and J. Pheffer, "Competitive Bidding for New Electric Power Supplies: Deregulation or Reregulation?" *Public Utilities Fortnightly* (September 17, 1987).

[99] J. D. Pace, "Deregulation Electric Generation," 286.

potential discriminatory or unreasonable prices. However, the cost-plus nature of revenue regulation results in price, X, cost, and technological inefficiencies. Moreover, price regulation is also blamed for cross-subsidization among customer classes thereby resulting in allocative inefficiency. Partial deregulation alternatives propose to eliminate one of these two regulatory decisions and thus rely upon either revenue or price regulation.

In either case, regulatory commissions set target revenues or utility prices outside of formal rate decision proceedings. The targets may be settled through negotiations with the utility to reach mutually agreed upon goals, or may be determined at the average levels performed by comparable utilities. The first method is often referred to as the social contract approach, while the second method is called the yardstick competition approach. However, these methods have some shortcomings. The social contract approach relies upon bargaining among a number of parties including regulatory commissions and utilities. The negotiated results therefore may be politically acceptable, but economically unreasonable. The yardstick approach is persuasive in the sense that the target levels are averaged among the comparable utilities and thus are neither high nor low; however, problems rise from the difficulty in finding comparable utilities that face the same or similar production and demand conditions. Because of these difficulties, the targets are often proposed to be set at current revenue or price levels. However, this method is also dangerous, especially when the current levels deviate from the correct revenue or price levels. The utility may face extraordinary gains or losses. Despite the difficulty in selecting initial revenue or price levels, both partial deregulation alternatives of revenue regulation and price regulation reduce regulatory commissions' workload and provide much flexibility in the utility's profit or price decisions.

To be more specific, "market basket" regulation reviewed in the National Telecommunications and Information Administration (NTIA) report falls into the revenue regulation category.[100] Such regulation, which

[100] National Telecommunications and Information Administration, *NTIA Regulatory Alternatives Report* (Washington, D.C.: U.S. Department of Commerce, July 1987).

takes the yardstick approach, compares a utility's stock performance with a market basket of stocks of comparable utilities. In the case where the utility earns greater than the market basket (that is, the comparable profit level) the utility is considered to be earning excess or monopoly profits and thus may be ordered to give refunds to its customers. The commissions only intervene in the decision of choosing the market basket, otherwise the utility practices its discretion on price settings within the basket. Therefore, marketbasket regulation eliminates costs associated with tariff proceedings.[101]

Under price regulation, the utility charges an initial price for a given time period. Later on, the price is regularly adjusted in accord with external indices that take into account consumer prices, producer prices, and/or productivity growth. Sudit,[102] Baumol,[103] and Crew, Kleindorfer and Sudit[104] have proposed formulas for the price adjustment. Their underlying idea is captured by the following formula:

$$P_t = P_{t-1} + P_{t-1}(\Delta PI/PI - PGR), \qquad (1)$$

where

P_t and P_{t-1} are prices in times t and t-1, t=1,2,...,n,
P_0 is the initial price when t=1,
$\Delta PI/PI$ is the actual change rate in a price index, and
PGR is the target productivity growth rate.

The selection of a price index and a target productivity growth rate may be made through negotiations among regulators and associated parties under the social contract approach, or through the regulators'

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[101] Ibid.
[102] E. Sudit, "Automatic Rate Adjustments Based on Total Factor Productivity Performance in Public Utility Regulation," ed. M. Crew, *Problems in Public Utility Economics and Regulation* (Lexington: Lexington Books, 1979), 55-72.
[103] W. Baumol, "Productivity Incentive Clauses and Rate Adjustment for Inflation, *Public Utility Fortnightly* (July 22, 1982): 11-18.
[104] M. Crew, P. Kleindorfer, and E. Sudit, "Incentives for Efficiency in the Nationalized Industries: Beyond the 1978 White Paper," *Journal of Industrial Affairs* 7 (Autumn 1979): 11-15.

consideration of the industry's average performance under the yardstick approach. Provided the calculated price is strictly imposed for a given period, price regulation not only removes any regulatory work related to revenue proceedings, but provides the utility with incentives to reduce costs. Since the utility's price is given and demand must be satisfied, the only variable controlled by the utility is cost. The utility will be encouraged to operate efficiently to reduce costs and increase profits. This scheme will be reviewed in more detail under the topic of incentive regulation.

Alternatives to the strict enforcement of this indexed price are price band and price cap methods. These alternatives provide the utility with some price discretion, not simply compliance with the indexed price. The price band method allows the utility to raise or lower price within an upper and lower boundary of a given price; for instance, $P_t \pm 0.05P_t$ in the case of a 5 percent band. The price cap method imposes only an upper limit on price. Therefore, under these methods the utility is free from regulatory scrutiny to set prices unless it violates the bands or caps. These alternatives minimizes regulatory intervention in the market.

Evaluation of Partial Deregulation

As reviewed, partial deregulation by a structural change of vertical disintegration, which is often accompanied by the removal of barriers to entry, proposed to encourage competition in particular levels or segments of the regulated industry where competition is feasible. For example, deregulated generating companies are expected to operate efficiently due to competitive forces from free entry in this level. Moreover, since the competitive company is likely to put the system to work to the extent that spot price is equal to its marginal running cost under the MIT scenario, it may be possible that electricity purchasing price by distributors is set at the marginal cost of generation. However, the proposal for vertical disintegration theoretically will be supported when the utilities do not benefit from economies of scope. It also leaves the efficiency problems of ROR regulation unsolved in the transmission and distribution companies, even though such partial deregulation by disintegration is regarded as

improving efficiency among deregulated generation companies. As long as final users' prices are affected by the costs which are subject to the transmission and distribution companies' performance, such partial deregulation still cannot ensure correct price signals are being sent to customers. On transaction costs, the proposal for structural changes yields new transactions or contracts among the generating power suppliers, transmitters, and distributors, which are coordinated under the current integrated structure.

In addition, the equity effects of vertical disintegration may score higher than complete deregulation but lower than ROR regulation. Since distribution companies are still under commission regulation, current administrative due process and other customer protection programs still will be accessible. Service termination and quality also will continue to be monitored, but with some limitations since power shortages or outages may result from the generation level, which is not under the control of regulatory agencies. Finally, the price effect of vertical disintegration is unclear. Efficient operations of the generating companies could lead to reduced utility prices for customers. Prices also would be simpler because there would be no demand charge, no customer charge, no backup charge, and no customer classes.[105] However, Pace doubts whether there will be enough free entry into the generating business to expand in a long-run optimal way under the continuous environmental constraints. Moreover, he argues that under the MIT scenario generating investments would be very risky due to market uncertainties, and could lead to high capital costs. Such possibilities among others may add to increased utility prices.[106]

Partial deregulation through regulatory changes of revenue and price regulation promotes efficiency mainly by creating incentives for profits. Under revenue regulation only, utilities are encouraged to take or share with customers excess profits above the target revenue. These profits are supposed to be passed to the customers under ROR regulation. Price regulation in either price band or price cap regulation gives the utilities flexibility in price or revenue decisions. The utilities will exploit

[105] J. D. Pace, "Deregulation of Electric Generation," 283.
[106] Ibid.

every chance to minimize costs because revenues and costs are not tied. Regarding competitive pressures, the effectiveness of both revenue and price regulation differs depending upon whether the yardstick approach or the social contract approach is employed. The yardstick approach puts indirect competitive pressures from peer utilities on each utility, since a utility's profit changes depending upon the revenue and productivity growth targets which are set at average performance of the peer utilities. On the other hand, the social contract approach does not produce outside competitive pressures. Rather, in situations where such pressures are present, this approach will be more effective in attaining efficiency. Without external competitive pressures, the utilities will be encouraged to charge prices as high as possible within the imposed limitations. With the presence of competition, price regulation forces the utilities to operate under marginal-cost pricing to eliminate cross-subsidies and take advantage of price competition with competitors. Therefore, the implementability of partial deregulation still depends upon whether a market structure can accommodate competition, but not to the extent of complete deregulation. Finally, revenue and price regulation streamline regulatory works of both regulatory agencies and the utilities without yielding particular transactions cost.

With respect to the equity aspects, prices under these proposals are likely to be lower in general, with more certainty with the presence of competitive forces. However, when price competition leads to the removal of cross-subsidies, those supported under ROR regulation will face price increases. In addition, regulatory agencies still function their reduced duties on monitoring service provision and customer relations. Therefore, customers are not expected to face any severe hardships from these aspects.

Evaluation of Market Structures

A policy alternative to ROR regulation has been introduced using some assumptions about the markets in which they are supposed to be implemented. The more these assumptions are satisfied, the more the alternative is implementable. Among the assumptions, the crucial factors affecting the implementability are associated with economies of scale and scope, sunk

costs or asset specificity of investments, and technical limitations of utility infrastructure. For illustration, the following discussion examines the market structures of the electric utility industry.

Economies of scale in the electric utility industry can be analyzed from various levels of the process of electricity supply: generation, transmission, distribution, or integration. It is generally agreed that economies of scale dominate in the transmission and distribution process; however, their presence at the generation level has been the subject of intense debates. Again, generation scale economies are frequently examined at the unit, plant, or firm level.

Economies of scale at the generation unit or plant level are closely related to the technology of generation. Therefore, a minimum efficient scale will vary among fossil-fueled steam, hydroelectric, and nuclear power generation. Joskow and Schmalensee, reviewing data from U.S. Department of Energy and several empirical studies, estimate that for steam generation a minimum efficiency plant capacity requires 800 megawatts--at least two generation units--to exploit available multiunit economies, while the minimum efficient scale for a nuclear power generation unit ranges from 900 to 1,100 megawatts.[107] They further argue that "[on] average the industry's existing capital stock for generation . . . does not appear to embody full exploitation of available plant-level economies of scale. . . . as old plants are replaced by efficient new ones, we can expect a substantial increase in plant-level concentration in bulk power markets. Competitive problems associated with deregulation may thus worsen over time as the generation capital stock turns over."[108]

Information about unit- or plant-level economies of scale generally provides implications for plant design and construction rather than deregulatory policy. On the other hand, generation economies of scale at the firm level often have been used to argue for or against promoting competition at the generation level. Christensen and Greene, focusing on steam generation in 1970, reported that only 48.7 percent of total electric power was generated by firms with significant unexploited scale

[107] P. L. Joskow and R. Schmalensee, *Markets for Power*.
[108] Ibid., 48-54.

economies.[109] In a later paper, based on the same 1970 data, they said that utilities with about 4,000 megawatts of capacity fully exploited economies of scale.[110] Twenty-year (five-year-interval) data of steam generation consisting of 114 firms (essentially the same data used by Christensen and Greene) was more thoroughly analyzed by Greene. He argued that the growth of firm size was outpacing that of the efficient scale; that is, the output level of average cost minimization. Moreover, the minimum efficient scale was estimated to be 10.4, 13.1, 17.4, 17.3, and 12.1 billion kilowatts for the years 1955, 1960, 1965, 1970, and 1975, implying that the average cost curve was flattening over time. The number of firms above the minimum efficient scale in 1975 was 24 out of 114 sample firms, which produced 57.8 percent of total electric power of the sample firms. From these findings, Greene concluded that "a growing proportion of output [steam generation] is being and will be produced under constant cost conditions."[111] The presence of exhausted scale economies in the generation level has been the principal rationale for the proposal that the market be deregulated to remove entry barriers and to promote competition.

However, these findings on generation scale economies at the firm level have limited application for today's regulatory decision making. The arguments based on these findings have been made without consideration of economies both of integration and of scope. Moreover, their findings are based on 1960s' and 70s' data at least a decade behind. Their sample sizes and partitions of time period could also cause different results. More fundamental problems arise from the separability of data about generation only from those firms that are vertically integrated or even involved in interfirm coordination.[112] As long as the effects of integration or interfirm coordination are spread to generation, as reasonably speculated, these

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[109] L. Christensen and W. Greene, "Economics of Scale in U.S. Electric Power Generation," *Journal of Political Economy* 84 (August 1976): 655-676.

[110] L. Christensen and W. Greene, "An Econometric Assessment of Cost Savings from Coordination in U.S. Electric Utility Power Generation," *Land Economics* 54 (May 1978): 139-155.

[111] W. Greene, "Maximum Likelihood Estimation of Econometric Frontier Functions," *Journal of Econometrics* XLIV (1980): 77-87.

[112] P. L. Joskow and R. Schmalensee, *Markets for Power*.

studies that focus solely on firm level scale economies of generation provide limited information evaluating policy alternatives.

Despite the lack of empirical studies, it is often argued that the current electric utilities benefit from the presence of economies of scope. Bonbright and others [113] consider "load diversity, pooling of reserve capacity and operating reserves, economic dispatch, and coordinated maintenance scheduling" as their sources. Those who have conservative views on the deregulatory movement in the electric utility industry even warn that its disintegration could lose the benefits from the horizontal interfirm coordination among the vertically integrated utilities, such as joint ownership of generating plants or transmission facilities and power pooling.[114]

Beyond the information about economies of scale and scope, sunk costs are another important factor to be considered for the policy alternatives. Sunk costs are defined as "the difference between ex ante opportunity cost of the [invested] funds [for a project] and the value that could be recovered, ex post, if it is decided to terminate the project."[115] Sunk costs, as opposed to fixed costs, act as barriers to entry and affect contestability.[116] Sunk costs are closely related with asset specificity since investments which are made for an idiosyncratic purpose have little possibility for alternative use. That is, idiosyncratic investments are of little marketability and thus their opportunity costs are often zero. When this is the case, deregulation of existing utilities along with an open entry policy may give opportunities just for the incumbents to explore excess profits without securing efficiency that would result from contestable markets. Regarding electric utilities, investments in generation plants, transmission grids, and distribution wire networks are very specialized to their original region and purpose. The capital

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[113] J. Bonbright, A. Danielsen, and D. Kamerschen, *Principles of Public Utility Rates*, 2nd ed. (Arlington, Virginia: Public Utilities Reports, Inc., 1988), 639.

[114] P. L. Joskow and R. Schmalensee, *Markets for Power*, 66-77.

[115] W. Sharkey, *The Theory of Natural Monopoly* (Cambridge: Cambridge University Press, 1982), 156.

[116] Ibid.; and W. Baumol, J. Panzar, and R. Willig, *Contestable Markets and the Theory of Industry Structure* (New York: Harcourt Brace Jovanovich, 1982).

facilities and equipment are nonliquid, and are difficult to convert to alternative use or transfer to other locations when the utilities are forced to terminate their service provision in the region. Therefore, a significant portion of the capital investment is irrevocable and sunk.[117]

Finally, engineering and construction technology have been the crucial determinants of market structure over time. With respect to generation, its technology has been advanced to secure more economical and reliable sources. The majority of generation still depends upon fossil fuels; that is, coal, oil and gas. In addition, despite the increasing role of nuclear power since the 1970s, its future is not clear because of environmental and security concerns. Currently under PURPA, independent power generation and cogeneration have increasingly brought competitive forces into the generation market. Even though their share is about 2.5 percent of the nation's electric power, their expansion is foreseen because they use cheap and plentiful energy sources, such as windmills and solar energy. These types of generation also do less harm to the environment.[118]

In addition, the feasibility of competition in the generation level greatly depends upon the transmission technology which transports high voltage electricity from generating plants to distribution stations. In relation to the deregulation scenario that the generation market is deregulated by allowing the entry of new generating companies and wholesale power sales without territorial boundaries, transmission technology may play a most significant role. Transmission grids are proposed to be common carriers accessible by any power seller in the deregulated power market to send electricity to any distributor. The concern at present lies with the capacity and technical control of these transmission grids which should accommodate voluminous traffic of power supplies.

Moreover, the technology regarding distribution networks still relies upon the most conventional wires and poles with spatial limitations of their installation or replacement. Unquestionably, redundant

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[117] C. Phillips, Jr., *The Regulation of Public Utilities: Theory and Practice* (Arlington, Virginia: Public Utilities Reports, Inc., 1985), 43; and J. C. Bonbright, A. L. Danielsen, and D. R. Kamerschen, *Principles of Public Utility Rates*, 30-31.

[118] P. Nulty, "Utilities Flirt with Adam Smith," *Fortune* 117, (June 6, 1988): 173-81.

infrastructures are economically inefficient and technology that makes competition feasible in the distribution market is yet to be developed.

Evaluation of Incentive Regulation

Incentive regulation involves automatic or deliberate monetary compensation to induce better performance. One group of incentive regulation alternatives introduces formulas from which price, cost, or rate of return standards are drawn. Since these standards are determined before a utility's actual costs occur, the utility is automatically rewarded or penalized according to its performance. The other group of incentive regulation alternatives introduces mathematical or quantitative techniques to measure performance. Regulatory commissions then incorporate performance measures into marking up a reward or a penalty based on a predetermined compensation schedule. While this latter group still relies upon traditional ROR regulation, the former group streamlines that.[119] In this sense, incentive regulation alternatives falling in the former group may be called "deregulatory incentive regulation alternatives." These alternatives may be further decomposed into two broad categories according to their pricing principles based on (a) marginal-cost pricing and (b) average-cost pricing.

Under incentive regulation based on marginal-cost pricing, formulas are developed such that a utility can maximize profits when it sets price at marginal cost. Incentive regulation based on average-cost pricing requires total costs and total revenues to be break-even, and thus is little concerned about marginal-cost pricing. The following sections

[119] Some of the incentive schemes have similar characteristics to partial deregulation in the sense that they abandon some of the current ROR regulatory practices. The key factor here to distinguish incentive regulation from partial deregulation is that incentives for the utilities to set price close to marginal cost or to reduce production costs result from the formulas used in incentive regulation schemes. Therefore, even though incentive regulation schemes, which employ the marginal-cost and the average-cost pricing principles, streamline traditional regulatory intervention in the rate-making process, this dissertation classifies them into incentive regulation.

define and evaluate incentive regulation methods, which apply these marginal-cost and average-cost pricing principles, along with (c) those based on performance.

Marginal-Cost Pricing Incentive Regulation

Marginal-cost pricing (MCP) incentive regulation seeks to achieve allocative efficiency; that is, remove the social welfare loss caused by the deviation from the optimal allocation of resources. As shown earlier, ROR regulation is superior to monopoly pricing in terms of allocative efficiency; however, it does not utilize resources in the most efficient way since it still results in a social welfare loss. MCP incentive regulation proposes to address this problem by introducing mechanisms under which a utility is encouraged to set price equal to marginal cost. Proposals made by Loeb and Magat,[120] Finsinger and Vogelsang,[121] and Cox and Issac[122] are representative cases of MCP incentive regulation.

Evaluation of MCP Incentive Regulation

MCP incentive regulation employs subsidies as an incentive variable in the models, which are designed such that marginal-cost pricing maximizes subsidies and thus profits. Unless their underlying assumptions (including knowledge about marginal cost and demand schedules) are violated, they obviously will provide profit maximizing utilities with incentives for efficiency improvements. With respect to transactions cost, they decentralize regulatory agency's traditional ratemaking burden and increase the utility's discretion. However, they may require a commission-based hearing process, for instance, when the utility requests an increase of the base price due to factor price increases. In such a case, commission

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[120] M. Loeb and W. Magat, "A Decentralized Method for Utility Regulation," *Journal of Law and Economics* 22 (1979): 399-404.

[121] J. Finsinger and I. Vogelsang, "Alternative Institutional Frameworks for Price Incentive Mechanisms," *Kyklos* (1981): 388-404.

[122] J. Cox and R. Issac, "A New Mechanism for Incentive Regulation: Theory and Experiment," Mimeograph, University of Arizona.

hearings simply shift their focus from the rate proceedings to determining the parameters which affect subsidies.[123] Moreover, they raise a new issue of how subsidies are paid for and by whom. This issue may call for creating a new governance structure and may result in high transaction costs for its administration.

Regarding service quality and administrative due process, the models would score lower than ROR regulation. Even though a new governing agency monitors service quality and customer complaints, its function may be much more streamlined than ROR regulation. On price effects, the models would remove cross-subsidies. Thus, subsidized or underpriced customers would be charged higher prices. In addition, the models theoretically would reduce overall prices because of the incentives for efficiency improvement. However, the incentives depend upon how their assumptions are met in practice.

One critical distribution issue arises from the way funds are collected for the subsidies. When subsidies are collected through general taxes, these models not only produce economic inefficiency due to their effects on consumer behavior (that is, price and substitution effects) but also involve wide income rearrangement since taxpayers are not exactly the same as utility customers. These models may result further in a pervasive distortion of profit distribution because of the dependency on an initial price. For instance, if the initial price used at the outset of their adoption is abnormally high, a utility will earn profits beyond a "reasonable" level.

Finally, under these incentive mechanisms actual demand schedules and marginal cost must be predictable for prices to be converged into marginal cost. Therefore, their use is difficult during inflationary and deflationary periods when demand schedules and marginal costs alike are uncertain. That is, these models are insensitive to price changes which affect a utility's production cost.

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[123] M. Crew and P. Kleindorfer, *The Economics of Public Utility Regulation* (Cambridge, Massachusetts: The MIT Press, 1986).

Average-Cost Pricing Incentive Regulation

Average-cost pricing (ACP) incentive regulation has been developed to avoid the above subsidy problem. The theoretical foundation of ROR regulation is also ACP's principle, which allows a utility to recover its costs. Incentive mechanisms falling within this ACP principle implicitly assume the presence of some internal inefficiency such as X-inefficiency and technological inefficiency. Their primary objective is to foster utilities to reduce such inefficiencies by introducing a performance target which is established independent of the utility's ability to manipulate. Utilities which exceed the target will be rewarded; otherwise they would face penalties. Based on this common principle several incentive programs have been proposed. They are grouped into (a) sliding scale plans, (b) cost adjustment mechanisms, and (c) price index adjustment mechanisms.

Sliding Scale Plans

The sliding scale plans allow a regulated utility to earn an extra profit if it performs better than its predetermined target "fair" rate of return on investment.[124] The target rate of return is obtained from the traditional ratemaking process at regular intervals. Once the target rate is determined, the utility is encouraged to reduce its costs and increase its earned profit rate. Under sliding scale plans, the utility shares with ratepayers a part of the profit rate difference between the target rate of return, r^*, and the actual earned rate of return, r_t. The actual allowed rate of return, r_t^a, is defined as $r_t^a = r_t + s(r^* - r_t)$, where s is the utility's rate sharing constant, ranging from 0 to 1.[125]

Traditional ROR regulation is a special case of this form when s is equal to one. ROR regulation allows only "fair" rate of return, thus, literally, a new rate of return is effectively set whenever any changes in costs occur. However, if the same length of the lag to the sliding scale

[124] P. Joskow and R. Schmalensee, "Incentive Regulation for Electric Utilities," *Yale Journal on Regulation* (1986): 1-49.
[125] Ibid.

plans is applied to ROR regulation and any gains or losses during the interval are assigned to the utility, ROR regulation takes the other extreme value of s: zero due to regulatory lag. Therefore, ROR regulation with regulatory lag may have the same effect as the sliding scale plans with a sharing rate dependent upon the length of the lag.

Cost Adjustment Mechanisms

Under ROR regulation, price is to be no less than a utility's average total cost so that the utility can cover its costs and continue to provide its services. Cross expresses this principle as $P = \alpha C$, where C is the utility's average cost and α is not less than one.[126] Cross divides average cost into true average cost, C_0, and wasteful cost due to inefficiencies, X. The utility's profit per unit of output is

$$\pi = (\alpha - 1)(C_0 + X). \tag{2}$$

This equation implies that profits rise with inefficiency unless the regulator disallows all "imprudent" costs. Cross suggests a remedy for this problem by modifying the formula to $P = \beta + \gamma C$, where β and γ are positive constants, with γ less than one. The Cross model may be rewritten in the form of a simple sliding scale model as

$$P_t^a = C_t + s(C^* - C_t), \tag{3}$$

which on rearrangement may be written as

$$P_t^a = sC^* + (1 - s)C_t. \tag{4}$$

Equation (7) is in the form of the Cross model where $\beta = sC^*$ and $\gamma = (1 - s)$. The formula indicates that the share of the cost difference between the allowed cost per unit of output, C^*, and the actual cost incurred by the utility, received by the ratepayers is s.

[126] J. Cross, "Incentive Pricing and Utility Regulation," *Quarterly Journal of Economics* 84 (May 1970): 236-253.

The size of γ determines the magnitude of the utility's incentives. In figure 5-1, the ray from the origin represents the cost-plus regulation model, $P = \alpha C$, while the line with intercept β denotes the Cross model. When costs are reduced from C^* to C_1, the price obtained from the Cross model is P_1' while the cost-plus regulation price is P_1''. Therefore, the utility receives $P_1'P_1''$ of the total price reduction, P^*P_1''. In the short term, higher s will result in greater cash flow to the utility, and thus higher incentives. In the long term, incentives depend upon how previous cost performance is reflected in the establishing of new cost targets.

The sliding scale plans and Cross model lack sensitivity to price variations in the general economy since the average cost target is obtained from historical data; the model is always one period behind the utility's actual operation. One solution is to provide some sensitivity by basing

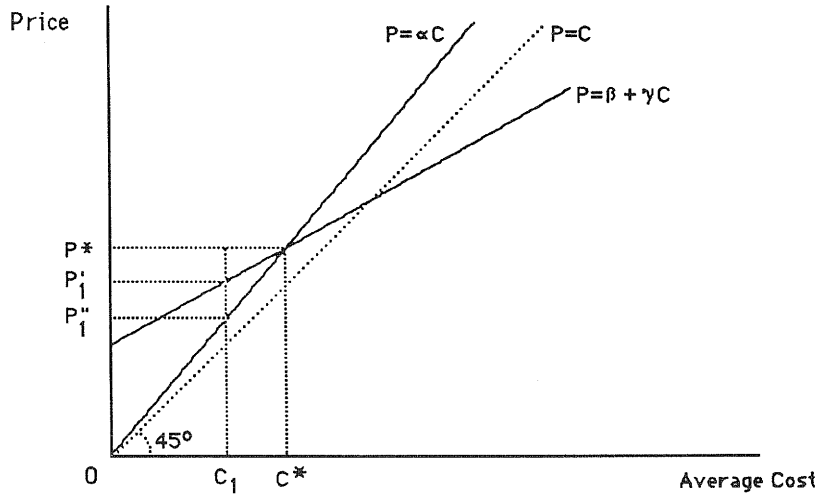

Fig. 5-1. Cross Model of Incentive Regulation

the target on the utility's projected average cost. The use of a future test period for the establishment of a cost or rate of return target will buffer the impacts of input price changes, especially in inflationary periods. However, in economic boom periods, this approach may lessen the favorable effect of regulatory lag on performance.[127] In addition, the success of the model depends on the quality of the forecasting.

The problem of cost manipulation may be solved by setting the cost target at the average cost of other comparable utilities. That is, the target is determined independently of the utility's own costs. This method is often referred to as a yardstick approach.[128] The pricing mechanism for the utility j among N comparable utilities is

$$P = \sum_{i \neq j} C_i/(N-1), \quad i=1,2,\ldots,N., \tag{5}$$

where C_i is the ith utility's cost per unit of output. Under this mechanism, the utility must bring about cost efficiency relative to other comparable utilities to earn above average profit. As the majority of the industry makes the same effort, competition will grow and the cost performance target will improve. Consequently, ratepayers benefit from such competition.

Price Index Adjustment Mechanisms

Price index adjustment mechanisms are the most sophisticated incentive schemes in terms of both sensitivity to the external price effects and neutrality to the influence of internal data. They employ an exogenous price index which is automatically updated at regular intervals with changes in input factor prices.[129] The price adjustment clause differs

[127] K. Costello, "A Review for the Federal Energy Regulatory Commission's Report, 'Incentive Regulation in the Electric Utility Industry,'" unpublished paper, June 1983.
[128] P. L. Joskow and R. Schmalensee, "Incentive Regulation."
[129] The price adjustment clause differs from the cost adjustment mechanisms in the sense that prices are adjusted by an exogenous factor price index and do not depend upon an estimated average cost, which is set in the cost adjustment mechanisms by regulatory commissions based on historical data or forecasts.

from the cost adjustment mechanisms of the previous section in the sense that prices are adjusted by an exogenous factor price index without regulatory intervention and do not depend upon an estimated average cost set by the regulator based on historical data or forecasts. The automatic adjustment makes the index independent of the utility's ability to manipulate costs. Moreover, the price index adjustment mechanisms often include productivity growth measures. Without such a provision it would be possible to earn normal profits even in the absence of improvements in performance.[130] In a nutshell, the price index adjustment programs are designed so that prices automatically change with changes in price and productivity indices. A number of versions of this scheme have been proposed. The mechanisms discussed below are a single factor price adjustment clause, Automatic Rate Adjustment Mechanism (ARAM),[131] and productivity incentive clause.[132] These mechanisms may be represented by the following generic form:

$$P_t = P_{t-1} + P_{t-1}\{\sum_i w_i(\Delta W_i/W_i) - \Delta E/E\}$$

or

$$\Delta P/P = \{\sum_i w_i(\Delta W_i/W_i) - \Delta E/E\}, \qquad (6)$$

where

P_t is the utility price in time, t,

$\Delta W_i/W_i$ is the percentage change in input price observed in the market,

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[130] K. W. Costello, "A Review for the Federal Energy Regulatory Commission's Report."

[131] Resource Consulting Group, Inc., *Final Report: Incentive Regulation in the Electric Utility Industry: Volume 1* (Washington, D.C.: Federal Energy Regulatory Commission, September 1983); and E. F. Sudit, "Automatic Rate Adjustments Based on Total Factor Productivity Performance in Public Utility Regulation," ed. M. Crew, *Problems in Public Utility Economics and Regulation* (Lexington: Lexington Books, 1979), 55-72.

[132] W. Baumol, "Productivity Incentive Clauses and Rate Adjustment for Inflation, *Public Utility Fortnightly* (July 22, 1982): 11-18.

w_i is the weight derived from input factors' respective share of total costs,

$\Delta E/E$ is the percentage change in productivity, and

P_0 is the initial rate selected by the regulatory agency.

The simplest application of this form is a single factor price adjustment clause. It takes into account the effect of the price change in a single input on rates, in the absence of productivity changes; that is, i=1 and $\Delta E/E=0$. An example is fuel price adjustment clause which has been adopted by several states.

All the other variants employ a composite index created by multiple factor prices. Their implementation procedures are discussed in a Resource Consulting Group, Inc. (RCG) report prepared for the Federal Energy Regulatory Commission.[133] The report suggests that rates be automatically adjusted every three to six months to reflect changes in input prices. Changes in the rate base are to be reviewed every three to five years except when there is a major change in capital stock. The change in price index is obtained by aggregating the percentage changes in each input price weighted by its contribution to total costs. The change in each input price is obtained by tracking some objective index in that input category, and productivity changes may be measured by total factor productivity.[134] It is also suggested that the target growth rate in the market be set on the basis of a prospective growth rate rather than the utility's actual productivity performance.[135]

The RCG report suggests an intertemporal scheme for sharing the rewards of reduced costs or productivity gains among ratepayers and the utility. In their scheme, the utility pockets any gains obtained during the base rate adjustment period. From the beginning of the following adjustment period, all cost reduction benefits are passed on to ratepayers. Baumol suggests that the share of benefits can be determined by the regulatory agency's discretionary choice of target values, price index, and

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[133] Resource Consulting Group, Inc., *Final Report*.
[134] M. A. Crew and P. R. Kleindorfer, "Productivity Incentives"; E. F. Sudit, "Automatic Rate Adjustments."
[135] W. J. Baumol, "Productivity Incentive Clauses."

productivity growth rates.[136] For example, the higher the target productivity growth rate, the larger the share of benefits to ratepayers. Crew and Kleindorfer employ an explicit share parameter, as in the sliding scale plans, in the model for sharing benefits.[137] Determining the effectiveness of these mechanisms requires further theoretical and empirical study.

Evaluation of ACP Incentive Regulation

Assuming that the proposed average-cost pricing (ACP) incentive regulation alternatives work in practice, they would provide utilities with efficiency incentives absent under ROR regulation. Moreover, the introduction of the yardstick approach in the cost adjustment and price index adjustment mechanisms would bring about indirect competitive forces to the utilities. ACP models would score poorly on marginal-cost pricing, since their pricing principle is still based on average cost. With respect to transactions cost, these alternatives are better than ROR regulation, but not by much. Even though they remove the traditional rate proceedings, a commission-based hearing is still required; the emphasis however shifts to the determination of parameters like MCP models. The parameters (including rate of return, average cost, initial base price, and rate of productivity growth) play a key role in defining the size of the monetary reward or penalty, and thus the utility's total profits. That is, under ACP models regulators would have to agree upon many more parameters, thereby making the regulatory process unwieldy.

With respect to price effects, ACP methods envision that utilities' efficiency improvement resulting from incentives is transformed into reducing customers' utility price. While the ACP alternatives may automatically guarantee economic sensitivity to external factors in various degrees, there remains the potential for reduced sensitivity to noneconomic considerations which may be of concern to customers, whose influence on the rate-making process is now reduced due to the automatic nature of the

[136] Ibid.
[137] M. A. Crew and P. R. Kleindorfer, "Productivity Incentives."

adjustments. In fact, customer protection would be safeguarded to the extent that monitoring service quality and consumer complaints would be maintained by streamlined regulatory agencies.

Finally, the success of ACP schemes heavily depends upon whether they generate incentives as designed and assumed. The following evaluates the sliding scale plans, cost adjustment mechanisms, and price index adjustment mechanisms focusing on their implementability.

Under the sliding scale plans, the firm has an obvious incentive to increase its profit rate, as long as the target rate of return is held constant for a given period. However, the plans suffer from their insensitivity to uncontrollable factors such as inflation. As external economic environments which have clear effects on utility's performance change, the target rate of return should be timely adjusted. If this process results in frequent rate hearings, the advantages of incentive inducement will be lost.

A cost adjustment mechanism proposed by Cross[138] is evaluated almost the same as the sliding scale plans. The Cross model is also insensitive to uncontrollable environmental factors. For example, during inflationary periods, allowed rates will be too low since price increases of inputs are not taken into account by the model. Therefore, the firm's actual allowed rate of return will decline over time, regardless of the firm's performance.[139] Another problem with these schemes is associated with the data source for determining the allowed cost. The target in the Cross model, as in the sliding scale plans, is derived from the firm's internal cost data. Therefore, there is room for manipulating costs and for transferring the exaggerated costs to ratepayers. The yardstick approach addresses this problem by using the average performance of comparable utilities. However, the model's weakness lies in selecting comparable utilities and identifying factors which affect cost. These comparable utilities must be homogeneous in terms of their internal accounting methods as well as external regulatory climate and there should be enough of them to obtain reliable averages.[140]

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[138] J. G. Cross, "Incentive Pricing."
[139] P. L. Joskow and R. Schmalensee, "Incentive Regulation."
[140] Ibid.

The index adjustment schemes are the most sophisticated. They are designed to absorb the impacts of external economic factors which utilities can not control. Since price is set by external indices, a utility earns a higher rate of return as it purchases input resources for less and uses them more efficiently. Thus, the utility is expected to negotiate with resource suppliers to reduce price. The chances for the utility to engage in price conspiracies with capital equipment suppliers and labor unions will be slight.

However, regarding implementation of the index adjustment formula, there is a methodological problem of indexing external prices. A variety of input factors contribute to a rate decision such as capital, labor, fuel, and other miscellaneous materials. It is not clear whether there exist reliable price indices and whether their use would be valid in this context. In fact, capital related costs have been recognized as difficult to calculate. Cost of capital varies depending upon the accounting methods used and is often excluded from the formula for this reason. Instead, it is implicitly embedded into the base rate as a constant term. Any increase of capital cost during the base rate adjustment period will not influence prices. Hence, the utilities may attempt to transform capital related costs into those factor costs which can be adjusted during the base rate-setting process.[141] In such a case, the index adjustment mechanisms may result in undercapitalization, contrary to the A-J effect of overcapitalization.

Performance-Based Incentive Regulation

The following statement by Kahn, then chairman of the New York State Public Service Commission, expresses the basic ideas of performance based incentive regulation:

> . . . a regulatory commission has an obligation, if it is to be something more than a rubber stamp automatically translating cost increases into rate increases, continuously to monitor the efficiency of the companies it regulates, and to exercise the utmost ingenuity in devising rewards and

[141] Resource Consulting Group, Inc., *Final Report*.

> penalties related to the efficiency with which those companies perform. . . . The first step in carrying out such responsibilities is the devising of the systems for assessing and measuring efficiency.[142]

That is, performance-based incentive regulation provides explicit monetary rewards for the utility practicing superior performance, or penalties for inferior performance. It requires at least two important steps for the development of incentive regulation mechanisms: development of performance measurement techniques and development of reward or penalty devices. Of these, as Kahn argues, accurate measurement of performance is the necessary condition.[143] Most literatures have focused on this measurement issue.

It has been recognized that there are multiple aspects of performance including quantitative and qualitative elements such as profit rate, sales, service quality, resource utilization, leadership, and worker satisfaction. However, within the context of incentive regulation, most performance measurement efforts have been limited to utilize those quantifiable variables; that is, input, output, and cost. The consequent performance measures are often expressed by input-output ratios or the degree of goal-attainment, which is often interchangeably used with the concept of efficiency. Its derivations include ratio analysis, total factor productivity, Aggregate Unit Cost Analysis,[144] regression analysis, and Data Envelopment Analysis,[145] In addition, a management audit is another widely used measurement technique which accommodates comprehensive aspects of performance using both quantitative and qualitative information.

Once a utility's performance is measured, the next step is to transform it into monetary rewards or penalties within a "zone of reasonableness" as a way of motivating the utility's behavior to improve future performance. The basic idea of implementing performance measures is

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[142] A. Kahn, "Foreword," in *Public Utility Productivity: Management and Measurement*, edited by W. L. Balk and J. M. Shafritz, a Symposium sponsored by the New York State Department of Public Service, Albany, New York, 1975.
[143] Ibid.
[144] Resource Consulting Group, Inc., *Final Report*.
[145] A. Charnes, W. Cooper, and E. Rhodes, "Measuring the Efficiency of Decision Making Units," *European Journal of Operational Research* 2 (1978): 429-444.

illustrated in figure 5-2, where the vertical axis represents penalties and rewards while the horizontal axis indicates a distribution of performance measures. A regulatory agency specifies a "dead band" along with penalty rates and reward rates. It also identifies the performance distribution and the regions on this distribution where the penalties and rewards operate. The utility whose performance falls within the "dead band" is neither penalized nor rewarded. The utilities whose performance index lies outside the "dead band" are correspondingly rewarded or penalized.[146] The reward or penalty function can take various forms of penalty and reward mix, for example, no penalties and progressive rewards or proportional penalties and rewards, as shown in figure 5-2.

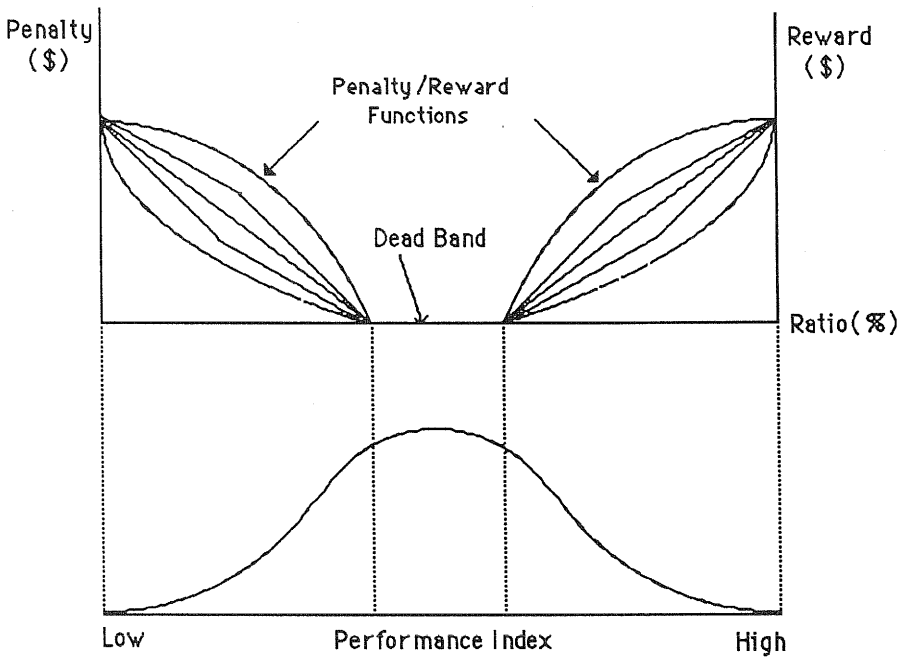

Fig. 5-2. Compensation Schedules under Performance-Based Incentive Regulation

[146] L. Johnson, *Incentives To Improve Electric Utility Performance* (Santa Monica, California: The Rand Corporation, March 1985).

Evaluation of Performance-Based Incentive Regulation

Performance-based incentive regulation would improve efficiency through incentives. Since monetary compensation is based on a utility's relative performance or ranking to other comparable utilities, the utilities should also implicitly compete with each other to earn rewards and avoid penalties. Such interutility competition can result indirectly from performance measurement and compensation, not direct market competition. Therefore, unlike deregulation alternatives the implementation of performance based incentive regulation, along with MCP and ACP incentive regulation, is little affected by market structures.

On utility price, service quality, and customer complaint handling, performance-based incentive regulation is virtually the same as ROR regulation, since it maintains current regulatory structures and practices. Thus, no customers will suffer seriously from the adoption of performance-based incentive regulation. Its major difference from ROR regulation and other types of incentive regulation is in terms of transactions cost. While other incentive regulation programs streamline regulatory activities and give more leverage to the utilities, performance-based incentive regulation require more resources to implement the incentive regulation programs.

As with ACP incentive mechanisms, the most important factor which affects the success of the incentive mechanisms is their implementability. As chapter 5 suggested, implementability includes the effectiveness of the incentive mechanisms to motivate management, the absorbability of external factors, the measurement of overall performance, and the obtainability of data.

The first criterion requires that compensation should directly affect management, which is responsible for any performance improvement. The related issue is to whom or in what form the rewards or penalties are to be paid or imposed. Compensation may be given to shareholders or managers by

reflecting it into allowed return on equity or management compensation.[147] The selection will depend upon which form induces more incentives for superior performance. RCG argues that if management has substantial ownership of the utility, compensation made to the utility's earnings will also affect management, bringing about changes in performance. However, the inside ownership rate of the utility industry is relatively low.[148] Therefore, RCG recommends the direct compensation method to management. In this way, shareholders will be concerned with the relationship between earnings ratio and managerial performance. When its correlation is not high, shareholders' interests will conflict with management's. Shareholders are unlikely to accept incentive mechanisms which compensate management, while the incentive programs do not contribute to an increase of the earnings ratio.[149]

Sensitivity to external factors in performance-based incentive plans does not mean exactly the same as in MCP and ACP incentive programs, since under performance-based incentive regulation a utility is rewarded or compensated based on its relative performance to the average performance of comparable utilities, not on price or productivity changes in the general economy. Therefore, the sensitivity of the measurement methods depends on how well the comparable utilities are selected. The comparable utilities represent that they have the same or similar production environment characteristics. Ideally, all factors not within the control of management should be identical. If such managerially uncontrollable factors are included in performance measurement, management will be unfairly penalized or rewarded. As discussed in the yardstick approach to partial deregulation and ACP incentive regulation, the selection of comparable utilities may be one of the most challenging tasks related to the implementation of the performance incentive programs.

Overall performance measurement relies upon whether the measurement methods can incorporate multiple inputs and outputs. If a subset of a

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[147] Resource Consulting Group, Inc., *Final Report*.
[148] RCG reports that only five of 102 electric utilities reported in the *Value Line Investment Survey* have more than a 1 percent inside ownership, compared 10 to 15 percent for large capitalized firms.
[149] Ibid.

utility's factor inputs or operations are used in measuring performance, the utility has an incentive to focus on only those aspects of the operation which are to be evaluated and ignore other aspects. Therefore, the utility may distort resource allocation for the purpose of improving performance in the subset of inputs or the production process. Regarding this matter, ratio analysis which calculates a ratio based on a single input and output is the poorest measure. Other measurement techniques can account for all inputs contributing to output, but they use different weighting methods to obtain an aggregate input and output, or rely on a functional relation of the related variables. Thus, the performance measures obtained from these techniques are expected to have some variations. The reliability of the performance measures is another key factor which determines the implementability of performance-based incentive regulation. This reliability is examined in detail in the next section.

Finally, with respect to the availability of data and the quantifiability of variables used in performance measurement, factor prices and/or physical quantities of input and output are required by TFP, regression analysis, and DEA. The values of these variables should be calculated from the information reported by the utilities. However, there is no unified method to compute factor prices, quantities, and sometimes measurement units. For example, labor unit is often measured by the total number of full-time workers. But the contribution of lawyers, engineers, and secretaries to output is likely to differ. To avoid this problem, Aggregate Unit Cost (AUC) measures (revenues per kilowatt-hour) are based on total revenues and total kilowatt-hour sales, which are readily available to regulatory commissions. In this case, a utility's total revenues are affected by the commission's allowance including factors such as "used and useful" capital, operating costs, rate of return, and construction work in progress. Therefore, AUC performance measures are affected by factors other than managerial performance.

An Examination of the Reliability of Performance Measures

The reliability or consistency of performance measures is investigated by comparing relative efficiency ratios and ranks created by total factor

productivity (TFP), regression analysis, and Data Envelopment Analysis (DEA). For this illustration, seventy-six privately owned United States electric utility firms for 1981[150] are analyzed.[151]

There are a number of firms which would fall in different compensation categories of reward, dead band, and penalty, depending upon the measurement techniques used. The presence of such discrepancies may undermine the reliability of the techniques, thereby implying that each technique represents different aspects of overall performance. Therefore, even in the case that measurement techniques can incorporate multiple inputs and outputs, it is still important to consider which factors are included in the creation of efficiency ratios in the context of incentive regulation. Incentives are likely to urge managers to behave in a specific manner, namely to improve efficiency on the incentive criteria. If these criteria are not properly selected, they can lead to distortions and unintended side effects. Therefore, the use of one of these measurement techniques as a basis of managerial incentives would result in considerable controversies and still be premature. That is, the respective use of performance measurement techniques as the basis of incentive would be risky due to the lack of reliability.

Summary

Up to this point, it has been examined how much deregulation and incentive regulation alternatives satisfy the criteria of efficiency, equity, and implementability. Furthermore, the alternatives should be compared with each other to identify which is superior. Since multiple alternatives and evaluation criteria are involved in this comparison, it is not easy to compare the alternatives based on this descriptive, qualitative evaluation information. Therefore, some comparison techniques are often used to reduce such qualitative information into quantitative terms.

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[150] L. Anselin and J. Henderson, *A Decision Support System for Utility Performance Evaluation* (Columbus, Ohio: The National Regulatory Research Institute, April 1985).

[151] The following briefly summarizes the findings. See Min You, "An Analysis of Alternatives to Rate of Return Regulation, unpublished Ph.D. dissertation (Columbus, Ohio: The Ohio State University, 1990), 181-185.

There are a number of comparison methods of dealing with multiple alternatives and multiple evaluation criteria.[152] The selection of an appropriate method should consider the nature of decision making and data availability. In this report, as the policy argument model implies, public decision making has been viewed as a group consensus resulting from debate among a group of policy makers. In addition, information about the expected impacts of each alternative on efficiency and equity attributes is limited and often controversial especially before the alternative is overtaken. Under such circumstances, a Goeller scorecard[153] is a useful method.

The scorecard, also often called a matrix, cross-tabulates alternatives with attributes. Typically, its users assign values to the alternatives for each attribute. The unit of value on each attribute does not need to be the same. It can be dollars, physical units, other quantified terms, or qualitative statements. The best and worst valued alternatives for each attribute are then highlighted for the purpose of more careful evaluation. The worst valued alternative especially will be the subject of further thorough investigation since policy makers likely will face the most intense objections from those who are affected by and care for the negative impact that as given alternative has on the attribute.

Unlike most other techniques, which attempt to aggregate multiple attributes of each alternative into a single number and ultimately a ranking, the scorecard method does not produce a complete, final decision. Rather, it is a summary table with numbers and statements which are updated as new information is found. As Quade argues based on the scorecard, "decision-makers will have questions and will want additional comparisons made and further systems and mixes of alternatives investigated."[154] Information emerging from the investigation will help decision makers

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[152] See C. Patton and D. Sawicki, *Basic Methods of Policy Analysis and Planning* (Englewood Cliffs, New Jersey: Prentice-Hall, 1986); and E. Stokey and R. Zeckhauser, *A Primer for Policy Analysis* (New York: W. W. Norton & Company, 1978).

[153] Cited in E. Quade, *Analysis for Public Decisions*, 2nd. ed. (New York: North Holland, 1982).

[154] Ibid., 67.

reconcile their positions with others. In this manner, the scorecard is a decision aiding device by which a claimant systematically investigates and summarizes relevant information.

As MacRae applies it, the scorecard method can be facilitated with the policy argument model.[155] The scorecard can reflect the principal views of the policy argument model that knowledge does not result from a logical and formal deduction, but from an agreement among various people, and that it is not static, but evolving over time. The scorecard method may be appropriate for use in public debate, where knowledge is interactive and evolutionary.[156] It has the capacity to accommodate the dynamic exchanges of information made in public debate for consensus building.

Table 5-1 illustrates a scorecard between alternatives and evaluation criteria. In the table, integers are assigned to the alternatives for their relative strengths or weaknesses as compared with ROR regulation with respect to the efficiency and equity attributes: 5 (much better), 4 (better), 3 (almost the same), 2 (worse), and 1 (much worse). In addition, the implementability of the incentive regulation deregulation alternatives is evaluated using descriptive terms: high, moderate, and low. The assigned ratings are a rough reflection of the evaluation made in the previous sections. However, as mentioned earlier, the values are not a subject to be agreed upon by a group of policy makers. The scorecard method does not rely upon aggregated group preferences which require explicit agreement on weights for the attributes among the policy makers with different value systems. Individual policy makers are free to rank the alternatives for their own reasons. Then, a group of policy makers are to agree on which alternative is the most preferred, not on explicit weights assigned to the alternatives.[157]

To summarize the important characteristics of the alternatives, complete deregulation and partial deregulation by vertical disintegration have their strengths on possible efficiency effects, while their equity

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[155] D. MacRae, Jr., "Professional Knowledge for Policy Discourse: Argumentation versus Reasoned Selection of Proposals," *Knowledge in Society* 1 (Fall 1988): 6-24.

[156] W. Dunn, *Public Policy Analysis: An Introduction* (Englewood Cliffs, New Jersey: Prentice-Hall, 1981).

[157] E. S. Quade, *Analysis for Public Decisions*, 221.

TABLE 5-1

GOELLER SCORECARD FOR EVALUATION OF ALTERNATIVES TO ROR REGULATION

	Efficiency Attributes				Equity Attributes		
Alternatives	Incentives for Cost Reduction	Competitive Pressures	Marginal Cost Pricing	Administrative Burdens	Utility Price	Service Quality	Administrative Due Process
Comprehensive Deregulation	5	5	5	5	1	2	1
- Franchise Bidding	5	4	3	1	4	2	2
Partial Deregulation							
- Vertical Disintegration	4	4	4	2	2	2	3
- Revenue Regulation	5	3-4	3-4	4	4	2-3	2-3
- Price Regulation	5	3-4	4	4	4	2-3	2-3
Marginal Cost Pricing Principle	5	3	5	1	2	2	2
Average Cost Pricing Principle							
- Sliding Scale Plans	4	3	3	4	3-4	2-3	3
- Cost Adjustment	4	3	3	4	3-4	2-3	3
- Price Index Adjustment	4	3	3	4	4	2	2
Performance Measurement							
- Ratio Analysis	4	3	3	2-3	3	3	3
- TFP	4	3	3	2-3	3	3	3
- ACP	4	3	3	2-3	3	3	3
- Regression Analysis	4	3	3	2-3	3	3	3
- DEA	4	3	3	2-3	3	3	3
- Management Audit	4	3	3	2-3	3	3	3

TABLE 5-1 (Continued)

GOELLER SCORECARD FOR EVALUATION OF ALTERNATIVES TO ROR REGULATION

Alternatives	Implementability (Theoretical Soundness and Data)				Implementability
	Absorbability of External, Uncontrollable Factors	Feedback to Management	Measurement of Overall Performance	Data Availability and Accessibility	Dependency on Market Conditions
Comprehensive Deregulation					High
- Franchise Bidding					Low-Moderate
Partial Deregulation					
- Vertical Disintegration					High at the Level Disintegration
- Revenue Regulation					Low
- Price Regulation					Low-Moderate
Marginal Cost Pricing Principle	Low	High	High	Low	
Average Cost Pricing Principle					
- Sliding Scale Plans	Low	High	High	High	
- Cost Adjustment	Low	High	High	High	
- Price Index Adjustment	High	Mod.-High	High	High	
Performance Measurement					
- Ratio Analysis	Low-Moderate	Moderate	Low	High	
- TFP	High	Mod.-High	High	Moderate	
- ACP	High	Mod.-High	High	High	
- Regression Analysis	Moderate-High	Mod.-High	High	Moderate	
- DEA	Moderate	Mod.-High	High	High	
- Management Audit	High	Mod.-High	High	High	

effects are highly questionable. Moreover, most critical blows to these alternatives result from the dependency of their implementability on market conditions. As reviewed, the current market structures of the electric utility industry have little capacity which makes competition feasible.

Regarding revenue and price regulation, both are likely to promote incentives for cost reduction. They also may not result in as dramatic a change in equity aspects as complete deregulation or vertical disintegration. Their future implementability will rely upon the choice of reasonable initial revenue and price targets, which are regularly adjusted corresponding to changes in economies. In addition, their success will depend less on market structures, but efficiency improvements from the adoption of these alternatives will be positively related to the presence of competition in the market.

With respect to incentive regulation alternatives, their adoption little depends on market conditions, but on their theoretical soundness and data. MCP incentive regulation formulas (Loeb-Magat model and its modifications) purport to lead to marginal-cost pricing. Their implementation is not yet convincing, however, because of their possible involvement with a more costly governance structure than ROR regulation, and the formulas' requirement of certainty about demand schedules and marginal cost.

Sliding scale plans and the Cross model of ACP incentive regulation envision that they will encourage utilities to minimize costs as long as such activities bring more returns to them. However, they suffer from an insensitivity to uncontrollable external economic changes. In addition, price index adjustment mechanisms can absorb the external economic changes in the formula as long as the indices are developed to reflect the external changes. These mechanisms as well as MCP and other ACP incentive regulation alternatives in fact streamline current ROR regulation practices. To this extent, they may provide certain flexibility in price and profit decisions for the utilities, but may be challenged due to the potential setbacks from current service quality and due process.

Finally, performance-based incentive regulation alternatives provide incentives relying upon more direct rewards and penalties than other incentive regulation schemes. Except for management audits, they also may

produce competition among the comparative utilities since a utility's performance is measured relative to the other utilities' performance. In addition, since these alternatives do not discard traditional ROR regulation, current equity status will be maintained. However, these programs have a shortcoming in their implementation: how are the comparative utilities--which should have the homogeneity of uncontrollable factors by management--selected? Difficulty in obtaining proper and timely data is another disadvantage of these schemes. Moreover, due to the lack of reliability, it is not yet clear which method of the several performance measurement methods figures correct managerial performance.

CHAPTER 6

POLICY CLAIMS AND CONCLUSION

So far we have examined theoretical and empirical efficiency issues under ROR regulation, and have evaluated policy alternatives to ROR regulation based on criteria developed. These discussions have been organized within the policy argument framework. Figure 6-1 summarizes the key elements of the framework.

Although theories and empirical analyses are unclear about the effects of regulation on efficiency, it is generally believed that regulation can potentially result in resource misallocation and underutilization, and technological retardation. Such **information** about efficiency serves as the initial ground in support of policy **claims** that governments should deregulate utilities or introduce incentive regulation. These claims are further justified by **warrants**. The warrant in deregulation relies upon the economic principle that competition assures efficiency, while incentive regulation relies upon the notion that monetary rewards or penalties provide managers with incentives to improve performance. However, these efficiency-based warrants are not sufficient to legitimize the claims of deregulation or incentive regulation. As one of the objectives of utility regulation is to protect customers from the potential abuses of uncontrolled monopoly power, policy alternatives are required to maintain the equity status achieved under ROR regulation. Therefore, this study included equity as well as efficiency in the standard warrant conditions or evaluation criteria.

Moreover, there are special situations, which make the claims conditional, that is, **rebuttals**. This report sought the rebuttals from the implementation or process perspective. As Pressman and Wildavsky concluded from the case study of the Economic Development Administration in Oakland, California, "implementation should not be divorced from [the design of] policy. . . . [It] must not be conceived as a process that takes place

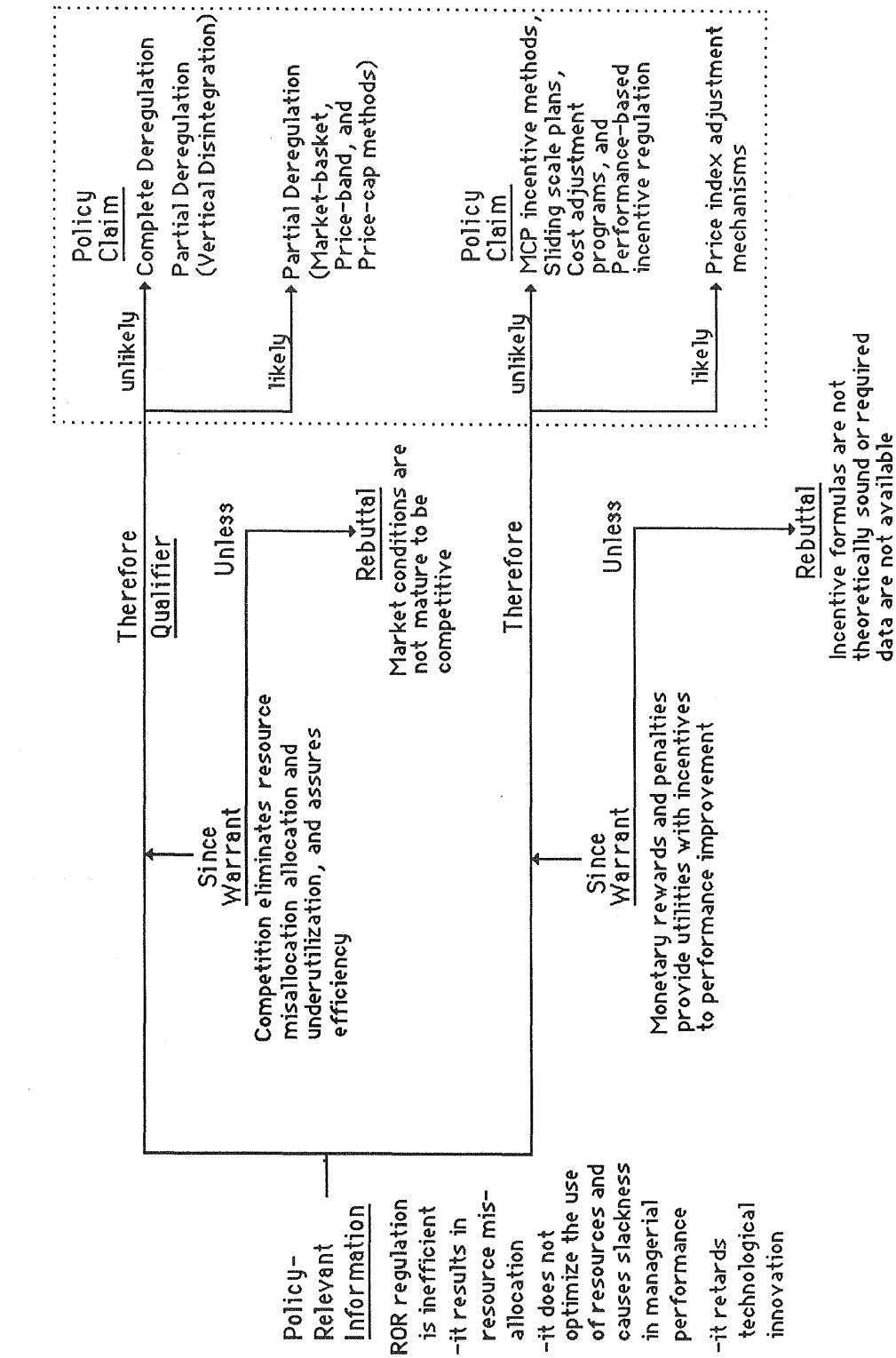

Fig 6-1. Summary of Alternative Regulatory Policy Claims Within the Argument Framework

after, and independent of, the design of policy."[158] That is, implementability should be included in the argument about policy formulation or adoption. Therefore, even though a regulatory policy alternative is justified both by efficiency and equity objectives, if the alternative is difficult to implement then its adoption will receive little support. Specifically, implementability conditions for deregulation are related to market conditions, while those for incentive regulation are associated with the availability of information necessary for the incentive formulas. Chapter 5 assessed alternatives to ROR regulation based on these warrant and rebuttal conditions.

The final step in evaluating the alternatives is to add **qualifiers** to the claims for the alternatives, given information, warrants, and rebuttals (dotted box in figure 6-1). Qualifiers indicate the cogency or strength of a claim. For example, when it is asserted that government should probably deregulate electric utilities, the modifier "probably" represents the qualifier. This chapter discusses such a qualified claim. Since implementability is a vital factor in determining the qualification of the claims, this chapter also discusses policies focusing on the improvement of implementability conditions. It concludes with a discussion of the significance and limitations of the study.

Qualified Policy Claims

Taking the cogency of a claim into consideration gives rise to qualified policy claims. That is, qualified claims possess familiar colloquial adverbs to express the cogencies, such as certainly, probably, plausibly, possibly, and likely.[159] However, their degrees of cogency are not discretely distinguishable, rather they are terms used to mark the relative strengths of the claims.[160]

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[158] J. Pressman and A. Wildavsky, *Implementation*, 3rd. ed. (Berkeley: University of California Press, 1984), 143.
[159] S. Toulmin, R. Rieke, and A. Janik, *An Introduction to Reasoning*, 2nd ed. (New York: MacMillan Publishing Co., Inc., 1984).
[160] A. Freeley, *Argumentation and Debate: Reasoned Decision-Making*, 5th ed. (Belmont, California: Wadsworth Publishing Co., Inc., 1981).

The qualifier attributed to an advocative claim is a function of information, warrants, and rebuttals. Moreover, the qualifier is affected not only by these elements' factual aspects but by claimants' value judgments. For example, claimants' positions regarding the regulatory alternatives may be influenced by their perspectives on the efficiency problems under ROR regulation. Those who think that the efficiency problems are serious and that governments should initiate a major regulatory change may strongly advocate deregulation. On the other hand, those who regard ROR regulation as an efficient governance structure from a transaction cost perspective or as a necessary structure for ensuring equity may favor regulation or suggest its modification in the form of incentive regulation to improve managerial efficiency.

The effects of personal value judgments on the determination of cogency are most serious when the efficiency and equity-based warrants are taken into account. That is, the cogency of a claim is closely related to how individual policy makers impose relative weights on these value attributes. Even where there is no disagreement about the evaluation of the alternatives and their summary scores, claimants may reach different conclusions because of different value judgments. Moreover, the efficiency and equity attributes of the alternatives, which have been examined in parallel in the previous chapter, often conflict with each other. In many cases, any action taken to improve efficiency results in a deterioration in equity, or vice versa.

In addition to such conflicting value criteria, policy makers face multiple alternatives where none clearly dominates all value attributes. Unless only one of these regulatory objectives (for example, efficiency) is taken as the evaluation criterion, there are no unanimously agreed upon or promising alternatives which would attain both efficiency and equity goals. Therefore, any claim for an alternative may draw objections from those who have different preferences and may be the subject of debate. This report leaves such value judgments to mutual agreement in such a debate process.

However, the cogency can be determined based on the rebuttal conditions; that is, implementability conditions, which depend less on value judgments and have more direct effects on the cogency. Goldstein, in the application of argument model to planning theory, points out the

importance of the role of rebuttals and the associated qualifiers for the following reasons:

> . . . the theoretical basis of support in the form of the warrants . . . from the social sciences tends to be partial, weak, probabilistic in nature, untested, untestable, or not generalizable in a high percentage of cases; [and] . . . arguments involve claims about the future and thus require conditional or contingent statements to account for uncertainty. . . .[161]

In other words, warrants are not conclusive and rebuttals are more likely to be present in most arguments of policy making. Moreover, rebuttals play a role as counter-warrants that weaken the cogency of a claim. For instance, the warrant based on the general economic principle that competition by deregulation of utilities yields economic efficiency is robust, only if special conditions such as natural monopoly and asset specificity do not exist. That is, rebuttals, implementability conditions, are most critical in discounting the strength of the claims.

Briefly, the evaluation of the implementability of alternatives suggests that the market structures in the electric utility industry are not mature enough to make competition feasible. Thus, complete deregulation and partial deregulation by vertical disintegration (both of which are most affected by the market structures) may be associated with a low degree of cogency, such as "unlikely." Partial deregulation through the market-basket, price-band or price-cap methods depends less upon market structures. However, the presence of competitive conditions will enhance the effectiveness of the partial deregulation methods. Therefore, a slightly higher degree of cogency (such as "likely") may be accredited to these partial deregulation alternatives.

The implementability of marginal-cost pricing incentive mechanisms, sliding scale plans, and cost adjustment programs is questionable due to their vulnerability to external economic conditions. Specifically, these incentive alternatives are difficult to implement during periods of extreme inflation and deflation. In addition, the lack of reliable performance

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[161] H. Goldstein, "Planning as Argumentation," *Environmental and Planning B: Planning and Design* 11 (1984): 300.

measures, among other things, places the implementability of performance-based incentive regulation in doubt. Therefore, the governments should be "unlikely" to replace ROR regulation by these alternatives. Finally, only price-index-adjustment schemes depend less on the implementability conditions, and thus may be given a higher cogency, "likely."

In sum, due to the lack of implementability, the regulatory alternatives evaluated in this report are not attractive either in current market structures or in their current forms. Therefore, this report will further discuss a general policy direction that can improve implementability related to deregulation, and will propose a performance monitoring system that is not greatly affected by the implementability conditions required of incentive regulation.

First, even though the market currently is not mature enough to accommodate competition, natural evolution may imply that all incomplete markets are moving toward free competition. Government intervention in business is considered abnormal in the free market economic system. As the U.S. Department of Justice recognizes, "[u]nder our economic system, free market competition is the norm and regulation is the exception."[162] As the economic causes which have brought about government regulation of utilities disappear, utilities are supposed to be left free. However, policy makers should take proactive actions to establish conditions which increase competition, not leave it to regulated utilities themselves. The utilities may be resistant to the movement toward competition to maintain their current franchised privileges.

In addition, changes toward deregulation should be gradual. Since there are so many uncertainties about their impacts, risks will become higher if they are introduced hastily. Moreover, it will be safer if deregulation is introduced in some states as experimental groups as in an experimental design. Findings from these states' experiences will provide good lessons to other states. As Nulty described this evolutionary and gradual perspective, "no one wants sudden and sweeping changes aimed solely

[162] U.S. Department of Justice, Reply Comments of the United States Department of Justice, Docket No. 87-313 (Washington, D.C., December 1987).

at lowering prices . . . [In addition], there's no going back to the good old days. Adam Smith has his toe in the door."[163]

Second, as mentioned earlier incentive regulation programs are not easily implementable. The separate use of performance measurement techniques as the basis for incentives would be especially risky due to their lack of reliability and validity. However, efficiency improvements (especially of the X-efficiency type) have been of great concern to regulators. Taking this concern into consideration, performance measurement techniques provide useful managerial information for improving performance in these utilities.

As performance monitoring tools, Data Envelopment Analysis (DEA) produces rich information, including not only relative efficiency scores but also reference utilities. The reference set produced by DEA suggests to inferior performing utilities which superior performing utilities use similar production technologies, and thus possibly could provide the most relevant managerial information. Former Texas Public Utility Commissioner Thomas applied DEA to the seventy-five regulated rural electric cooperatives in Texas in the context of management audits.[164] He argued that DEA has advantages over other efficiency diagnostic techniques, such as ratio and regression analyses used by the Rural Electrification Administration and the Cooperative Finance Corporation, because DEA can

1) prioritize which audit candidates need more immediate attention,

2) target specific areas and activities of an audit candidate that may need attention, and

3) . . . identify a comparison set of . . . other regulated entities in that category that are rated as efficient and are most like the entity being considered.[165]

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[163] P. Nulty, "Utilities Flirt with Adam Smith," *Fortune* 117 (June 6, 1988): 191.

[164] D. Thomas, "Auditing the Efficiency of Regulated Companies: An Application of Data Envelopment Analysis to Electric Cooperatives," unpublished Ph.D. Dissertation (Austin, Texas: The University of Texas, Graduate School of Business, 1986).

[165] Ibid.

He also added that the introduction of DEA to audits could save the time and staff resources traditionally required for audits, and consequently could expand the number of audits using the same resources.

Despite the informative nature of DEA, it should be noted that the typical DEA program is not able to separate scale efficiency. DEA efficiency measures are also sensitive to extreme observations. Therefore, it is too early to advocate DEA as a substitute for other performance measurement techniques. Their use depends upon the aspect of performance under investigation. For the purpose of using them as performance monitoring, they complement each other to produce more robust information.

Therefore, this report recommends that governments act to reinforce competitive forces in the regulated industry and gradually deregulate it. It also recommends that deregulatory alternatives be examined experimentally in some states. Additionally, in the short term, the introduction of performance monitoring systems will provide inferior utilities with useful information about efficient technologies and effective management. Moreover, the implementation of such monitoring systems will not require large commitments of resources. They can be deployed more quickly with fewer risks during a transition period when competitive forces are gradually strengthened.

Significance and Limitations of the Study

The significance of this study lies in both the establishment of a regulatory policy making framework from the policy argument perspective and in the specific contents of each chapter as an element of the framework. The framework enables us to accommodate comprehensive information produced both by analytical and normative modes of inquiry. It also encourages policy makers to reach a consensus through interactive communication. In addition, the report reviewed a wide array of literature and attempts to classify it systematically.

First, there have been many published papers which discuss efficiency problems in and policy alternatives to ROR regulation. However, their analyses are partial in the sense that they have not provided the links between alternative regulatory schemes and their implementability. These papers reflect the traditional logic of policy inquiry which has tended to

take methodologically positivistic approaches, including behavioralistic and economic approaches, and to emphasize law-like knowledge. This report employed these approaches in each chapter; however, they were systematically synthesized with other approaches within the overarching argument framework. That is, the argument framework has its strength in integrating divergent views of various disciplines. It fits well the investigation of public policy as an interdisciplinary study. Its application to regulatory policy analysis is new and will play a significant role in contributing to the systematic development of policy alternatives to resolve policy issues.

Second, while the policy argument framework was used as a structure under which all the elements of argument are laid out, its real merit is associated with the process and action orientation in the actual policy making field.[166] In group or collective decision making which most often characterizes public policy making, there is no generally agreed upon rational rule of aggregating the different preferences participants have for alternatives.[167] In fact, new policies often are adopted after intense exchanges of opinion among the participants. It is the policy argument framework introduced here that can be of enormous use for each participant to argue his or her claim with reason in such public debates for policy making. The use of argument in public debates would promote the communication of different views, efforts to reach reconciliation, and creative, adaptive and emergent thinking to a reality of policy making which the participants intersubjectively construct.[168] In addition, its utility is greater in regulatory policy making which is often characterized as quasilegislative or quasijudicial decision making. That is, participants in regulatory policy making are assumed to be familiar with the format of legal debate and thus the policy argument framework.

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[166] C. Willard, *A Theory of Argumentation* (Tuscaloosa, Alabama: The University of Alabama Press, 1989).
[167] K. Arrow, *Social Choice and Individual Values* (New York: John Wiley & Sons, 1963).
[168] C. A. Willard, *A Theory of Argumentation*.

In addition, in establishing standard warrant and rebuttal conditions for alternative regulatory policy claims, this study developed a comprehensive set of evaluation criteria. The criteria also were grounded in both normative regulatory objectives and in their implementability to reflect the practical utility of policy alternatives to practitioners who are involved in regulatory policy making. Practitioners want implementable propositions and theories which can be incorporated into the formal policy making process. However, few academicians and practitioners have made rigorous efforts to develop evaluation criteria of regulatory alternatives. Policy analysts, who are defined by disciplinary boundaries, often use a partial set of the relevant criteria and get policy claims.[169] The previous evaluation studies are based on vague criteria without providing detailed description,[170] or on only economic efficiency criteria.[171] The evaluation criteria in this study are more comprehensive and specific. This comprehensive set of evaluation criteria may advocate a policy claim within a broader context of reasoning. The criteria also may be used as a guideline for claimants to self-diagnose their claims and thus prepare to defend their arguments from critics, while allowing the critics to point out the weaknesses of the claims.

The study also has room for improvement. First, empirical studies should be reinforced. Within the argument framework, empirical evidence on the regulatory effects on efficiency and market structure plays a significant role in examining whether ROR regulation is inefficient and if the current structure of the regulated market can accommodate competition. As mentioned, the empirical results very much depend upon data used and model specifications.

In addition, further improvement should be made from the perspective of argument methodology. The report has focused more on discussing substantive contents of policy alternatives to ROR regulation than the

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[169] D. MacRae, Jr., "Professional Knowledge for Policy Discourse: Argumentation versus Reasoned Selection of Proposals," *Knowledge in Society* 1 (Fall 1988): 6-24.

[170] M. Crew and P. Kleindorfer, *The Economics of Public Utility Regulation* (Cambridge, Massachusetts: The MIT Press, 1986).

[171] P. Joskow and R. Schmalensee, *Markets for Power: An Analysis of Electric Utility Deregulation* (Cambridge, Massachusetts: The MIT Press, 1983).

argument theory itself, which has framed the discussion. As attempted in the report, the structural form of argument which consists of six elements can help to organize relevant information and advance claims. However, the real advantage lies in its use in public debate over policy making. For the argument framework to be effective as a promoter of public debate, its users are required to acknowledge some kind of criteria of evaluating overall argument, formats of debate, and modes of resolution. While the structural form and elements of argument are similar among the different fields such as law, medicine, natural science, business, and public policy, there are variants in the appraisal of knowledge claim, the degree of formality, and the mode of resolution.[172] The study has dealt only with the first step, the presentation of information and evidence based on the argument structural form. Further work should be done on these factors which are closely related with the actual discourse process. Hambrick[173] and Dunn[174] have provided the kinds of criticisms to which each element is susceptible and thus threaten the claims. Articulation of such factors would provide a checklist to both critics and advocates of a claim where flaws are present. With respect to formality and resolution, the current hearing and rate-making process practiced by the regulatory commissions may be adopted with modifications. The articulation of the principles of argumentation and the ways of managing the discourse will make a great contribution to enhance the quality of policy making.

[172] S. E. Toulmin, R. Rieke, and A. Janik, *Introduction to Reasoning.*
[173] R. Hambrick, "A Guide for the Analysis of Policy Arguments," *Policy Sciences* 5 (December 1974): 469-478.
[174] W. Dunn, *Public Policy Analysis: An Introduction* (Englewood Cliffs, New Jersey: Prentice-Hall, 1981).

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