

Fundamentals of Economic Regulation

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Fundamental Principles

Three decades ago, the energy, telecommunications, and water industries were viewed as natural monopolies. While huge computers clearly had the potential for reducing telephone switching costs, the giants, IBM and AT&T, reigned supreme in their respective U.S. markets. State enterprises provided telecommunications services for most other countries. Before the oil price shocks of the 1970's and the emergence of the environmental movement, electricity and natural gas firms seemed to have unlimited scale economies. With rapidly growing demand, fossil fuels began to share the market with nuclear power -- predicted to make energy so inexpensive that it would not be metered! Water supply had not yet emerged as central to the developmental process.

Today, the situations have changed dramatically. Fortunately, the basic principles of economics are still relevant for today's setting. However, the policy implications of natural monopoly and slow technological change are very different from those recently associated with competitive markets and dramatic innovations. In telecommunications, the potential for multi-media technologies has spawned a host of strategic alliances among cable companies, cellular firms, long distance companies, and traditional local wire-line telephone service providers. The break-up of the Bell system in the U.S. has greatly complicated public policy development towards firms that want to build the information highways of the future. Global strategic alliances have altered the structure of the international telecommunications industry. Similarly, energy firms have had to respond to dislocations and other changes in the basic conditions that characterized the industry only a few decades ago. In the U.K. and elsewhere, former stodgy water utilities are becoming multi-utilities.

The lesson for me as an educator is that decision-makers need to understand fundamental principles of scarcity and choice. They also need to appreciate how we got where we are: history matters. But preparing for the future entails more than understanding the past -- it requires critical thinking with regard to alternative policies. The key issue involves recognizing that we give something up when a choice is made: we give up an alternative policy and its outcomes. That message from economics has not changed over the years -- and it is far too often ignored by policy makers!

The Process of Decision-making

Both regulatory agencies and firms must bring together diverse disciplines in the examination of policy issues. Of course, truly important issues are seldom susceptible to simplistic modeling efforts, but analysts ought to be able to resolve methodological issues. External assistance can occur at several stages: problem definition, the identification of policy options, the analysis of those policies, and the evaluation of how each policy meets various objectives (See **Figure 1**). Ultimately, decision-makers must choose policies based on the weights given to the objectives (such as growth, efficiency, and fairness). While there is no simple way to translate citizen preferences into clear rankings of policy alternatives, if the initial steps are done well, economic performance can be enhanced.

At the *problem definition* stage, we must ensure that policy-makers are not misstating the issue at hand. For example, if there is a concern that certain groups are not receiving service (due to high costs or low incomes), the problem should not necessarily be defined as how to lower price to all customers, but how to target appropriate populations. Similarly, in telecommunications, identifying the problem as "too little" investment in advanced infrastructure pre-judges the situation. Analysts need to step back and consider the context in which policy issues arise.

The second stage of policy development is the *identification of conceptual frameworks, social objectives, and policy alternatives*. Recognition of resource constraints, development of valued outcomes, and a complete listing of options is crucial to policy selection. One reason politicians in state and national capitals sometimes make serious mistakes is that this stage of the problem solving process is handled so poorly: "If we don't know where we're going, it doesn't matter which road we take."

The third stage, *analysis*, a key component of a regulatory tool kit. Economists structure analysis in terms of constraints, values, behavioral tendencies, and interactions within complex systems. Good analysis requires empirical estimates of key parameters, as well as sensitivity tests when uncertainties are substantial. Technical reviews of internal and external studies are essential. Regulatory analysts who are off the mark are not likely to be listened to next time around.

The next stage, *evaluation*, focuses on how policy options affect the achievement of stated goals. Once these outcomes are enumerated, support staff steps back from the policy-making process, since technical expertise stops at this point. As individuals, we all tend to assign weights to various social objectives, but our values may not be shared by others who are paying for (or benefiting from) the policy that is ultimately selected. Regulators face a unique challenge in trying to prioritize and balance multiple objectives. Note that *establishing* weights (or priorities) is not the same as *communicating* those weights. In the negotiation process, fully revealing regulatory priorities may be a strategic mistake. Others involved in bargaining might be able to use that information to their advantage. Thus, a more general listing of objectives may be appropriate for policy-makers.

The final step of the DIAEC process involves making a *choice* from among the policy options. Good decision-makers, whether infrastructure regulators or executives in private industry choose the best solution given the weights for each objective. For example, regulators might give efficiency impacts a high weight, and public acceptability a low weight if citizens currently have a favorable opinion of the regulatory process. Objectives need to be balanced against one another -- where the weights indicate appropriate trade-offs. Similarly, an executive considering two alternative patterns of infrastructure investment will need to balance risks associated with each plan against the expected returns.

Making a *good decision* requires a particular set of skills. Making a *decision good* requires that the decision actually be implemented and that appropriate organizational resources be devoted to ensuring its success. Turning plans into action involves managerial talent, information flows, and well-crafted incentives for those responsible for *policy implementation*.

Finally, *decision evaluation* is an important, but neglected, stage in the policy process. When outcomes are realized, decision-makers need to compare actual results with those predicted in the initial policy analysis. If a systematic pattern of errors can be identified, then steps need to be taken to reduce sources of error. Organizations that never evaluate their own performance are unlikely to improve over time. A bench marking process can help decision-makers target key links in the decision-process. One such link is the conceptual framework used for decision-analysis.

Conceptual Frameworks for Analysis

Figure 2 lists some concepts that are useful in policy analysis. Terms like markets, profits, incremental benefits and costs, transactions costs, and public interest vs. the economic theory of regulation need to be understood. *Markets* bring buyers and sellers together. The laws of supply and demand cannot be ignored. However, competitive outcomes only occur when the number of suppliers and demanders is large enough so that suppliers and consumers are price-takers. The presence of market power provides a potential justification for intervention (through regulatory authorities). A key task for regulators is to limit the exercise of market power by natural monopolies. Natural monopoly, a situation where a single producer is the least-cost industry configuration, will be discussed in later sessions. Of course, the existence of high *profits* (or high returns on investment) is not necessarily evidence of market power. Successful innovations and risk bearing are two other explanations for high returns.

As noted, an understanding of the determinants of supply and demand is essential if the market conditions are to be analyzed correctly. *Technological constraints*, combined with input prices determine the extent of scale economies and opportunities for cost reductions. Supply depends on the nature of available technologies and prices of labor, capital, raw materials, and other inputs. Increases in input prices shift the supply curve up. Improvements in technologies and new entrants shift the supply curve out. For a given demand, such supply shifts have predictable impacts on the equilibrium price.

Market demand consists of the sum of individual demands. These demands may be from industry, commercial entities, governments (for example, for street lights), and residences. The pace and pattern of demand growth depends on income growth, prices of substitutes, and the price of the particular service. Holding supply constant, if income increases, the demand for a normal good will shift out--again with a predictable impact on price. The *Laws of Supply and Demand* cannot be overturned by legislative action or by regulatory mandate.

Marginal or incremental analyses are important for evaluating policy options. Economists tend to frame issues in terms of "more or less," not "all or nothing": a little more output, slightly more rapid investment, slightly lower prices. Thus, the *incremental benefits and costs* of a decision tend to be what matter. However, sometimes alternative regimes imply very different output configurations -- in which case, valuing relative performance under the alternative policies is complicated.

Another set of concepts utilized in the training course relates to *transactions costs*. Markets are not costless. There can be *coordination costs* associated with searching for, evaluating, and exchanging services. Also, *motivational problems* and *costs* arise from information incompleteness and imperfect commitment (and *opportunism*). The costs associated with infrastructure are often *fixed*, have *minimal salvage value*, and are *long lasting* -- so, the credibility of regulatory commitments affects the riskiness of the investment (and the cost of capital). If commitments can be ignored (or the rules can be arbitrarily changed) opportunistic regulators will extract rents from firms once investments are sunk. Also, *information asymmetries* are an especially important issue in the context of regulation, where firms have more information regarding available technologies, actual effort, and service quality. These information differences also suggest that regulation might be manipulated to benefit particular groups.

Regulation is often characterized as a form of taxation. Coalitions of suppliers and demanders promote particular price structures so that they benefit from the institutional arrangements. In the case of a natural monopoly, sustained investment may require a regulatory contract -- limiting opportunistic behavior by regulators after the firm has made substantial investments (which are now sunk). In addition, entry restrictions mean that prices do not need to track costs. A system of implicit taxes and subsidies develops.

New technologies that promote entry (or self-production) can make those prices unsustainable.

The likelihood of arbitrary and unilateral policy changes reduces the incentives to invest in long-lived infrastructure capital. As Levy and Spiller (1993, p. 2) have argued, "A necessary condition for a regulatory system to aid in attracting private investment is that three complementary mechanisms restraining arbitrary administrative action all be in place: a) substantive restraints on the discretion of the regulator must be embedded in the design of the regulatory system; b) there must be formal or informal constraints on changing the regulatory system; and c) there must exist institutions that enforce the above formal (substantive or procedural) constraints." What they label a nation's "institutional endowment" becomes an important feature of the economic environment.

Thus, organizations can be viewed as a collection of contracts (both formal and informal) which determine who has resources, who has information, who makes decisions, and how rewards are made. Within an institutional setting, organizations respond to incentives and create incentives. Economics assumes that people are rational, evaluative and maximizing -- so the opportunity sets and preferences of individuals determine choices. Such behavior can be observed within firms and within regulatory agencies. In both organizations, specialization and division of labor requires some coordination. Information can be centralized or decentralized. In the latter case, prices and markets provide signals and incentives. Nevertheless, transactions costs arise in market transactions and in internal transactions.

These concepts are useful for analyzing issues. No one has all the answers to the issues facing regulators and infrastructure executives. Most organizations have staff who have answers to questions no one is asking. *Knowing the right questions is the key to good policy development and implementation.* Those advocating change deserve to be heard by regulators, because the status quo is seldom the "best of all possible worlds". On the other hand, many policy options could leave us far worse off than we now are. The art of policy-making involves determining which policies have low down-side risk with substantial upside potential. The art of policy-making involves asking the right questions.

Market Structure and Industry Performance

The future configuration of any infrastructure industry is a question-mark. No one has a crystal ball that allows him or her to know the optimal degree of vertical integration, pricing of access, or who the least cost suppliers are likely to be. However, the regulatory process ought to be developing information on these questions. Regulatory rules ought to promote the evolution of a structure that yields efficient and innovative performance. For example, **Figure 3** illustrates the impact of entry restrictions in a potentially competitive market. One part shows how an increase in demand raises price. The initial consumers are harmed by a new set of consumers. The shaded area represents a loss in the *consumer surplus* associated with D.

The other figure shows how a new set of suppliers shifts out the aggregate supply -- driving price from \$3 to \$2 in this example. The initial suppliers are harmed by entry which lowers price. So one can see how the private harm from such entry is concentrated among a set of (perhaps twenty) firms, while the benefits to thousands of customers from the price reduction are large in total but small on a per capita basis. The S_0 suppliers have an incentive to go to the legislature to restrict entry: to avoid loss of *producer's surplus*. Similarly, regulators are lobbied to protect incumbent suppliers. Note that in some cases, protection can be justified -- as when a natural monopolist's prices induce entry in some product lines (or geographic areas).

This paper outlines an economic approach to linking market structure to industry performance. It is essential that regulators adopt rules and incentive mechanisms that promote efficient and reliable electricity service. Thus, present industry players will either adapt or go into decline. Some laggards will exit the industry. This is a Darwinian view of industry evolution -- survival of the fittest. Suppliers who cannot or will not perform up to best practice will ultimately be driven from the marketplace because it is in no one's

interest to keep incompetent managers or under-performing suppliers around. Poor performers will be absorbed or by-passed. Some successful suppliers may be bought by others. Good performers will be valuable, and other suppliers may be willing to pay for that value.

A good Darwinian regulator would ask: How do I know if a supplier is "fit." A key clue is the extent to which the supplier is maximizing the value to owners, given the incentives established by regulation. For investor-owned firms, the market price of the stock provides a good index of the value of the firm. Poor performance leads to a low stock price, which leads to dissatisfied owners. Management is either ousted or the firm is taken-over by another entity that can create more value with the firm's assets. In the process of restructuring, costs are reduced, customers are better served, and competitive threats are met. Of course, a low stock price (reflecting low expected returns) may also be due to poor regulation. If a holding company is involved, shares of the individual utility company will not be publicly traded -- so this indicator of performance is limited.

In the case of nationalized systems and municipal utilities, fitness still depends on maximization of value. Since ownership shares are not traded on an hourly basis, value is harder to determine. Most government-owned infrastructure providers do not have indicators of value maximization, though they should. One should look at value for the ratepayer/taxpayer, since this is the constituency that is at risk if performance deteriorates. The net present value of the utility can be calculated in terms of low prices paid by customers and high transfers to national and state treasuries and to municipalities. The beneficiaries of cost containment and improved customer services are the ratepayers and taxpayers. Here is where the pressure for good performance comes. Politicians are proxies for citizen-owners. Elected officials ought to want value-maximization, though the voices of special interests can drown out broader concerns. Customers want efficiency and low prices, governments want large transfers and low prices to politically powerful groups, investors want returns commensurate with the associated business risks. In all these cases, value maximization is the indicator of good performance. Poor managers can survive in an era of franchised service territories and protective regulation. How long such protection is likely to remain depends on national policies and how regulators apply the tools at their disposal.

Economists have a conceptual framework that relates market structure to industry performance. **Figure 4** depicts the traditional features of infrastructure industries, like electricity supply, telecommunications, natural gas, and water/sewerage. Fundamental economic factors determine the structure of an industry. These "Basic conditions" include production technologies and consumer preference patterns. Factors influencing supply and demand determine the efficient configuration of the industry. For example, electricity restructuring is an issue in most nations. Because of technological changes, low natural gas prices, changes in public attitudes, and government intervention, markets are experiencing changes in the basic conditions which influence them. These economic forces for change are powerful, inevitable, and highly disruptive. Industry observers are concluding that the natural monopoly features of the industry are mainly in transmission and distribution. Generation is going to be competitive. Some countries are promoting retail choice.

Note the flow of causation in traditional utilities. Basic conditions determine structure. Structure influences pricing behavior, and the resulting industry performance is an outcome of the economic processes at work. Of course, the traditional utility market structure (no entry, single supplier, vertical integration, and homogenous output) was heavily conditioned by both regulation and public ownership which arose to constrain monopoly power. Infrastructure industries face similar sets of challenges. These will be outlined in some detail during this program.

Basic conditions facing an industry influence the number and size distribution of suppliers which are feasible in an industry. As noted earlier, lists the traditional features comprising the structure, behavior, and

performance of public utility industries involve important linkages. Causation runs from the basic conditions to industry structure (entry conditions, number of firms, and degree of vertical integration and product differentiation). Industry structure determines, in turn, the behaviors likely to be observed (prices, promotion, research and development, production process changes, and new service introductions). The market outcomes can then be described in terms of performance criteria (profitability, efficiency, innovation, and meeting other social objectives). Clearly there are feedbacks in this process--for example, high levels of R&D can lead to innovations which affect the production technologies and entry conditions.

Traditional regulation (particularly as developed in the U.S.) influenced the structure of industries and limited the range of behaviors observed. Regulatory rules defined markets, constrained entry, and facilitated vertical integration by firms in all five industries covered in our surveys. Thus, cost-based rate of return on rate base regulation (ROR) was designed to enable the firm to earn a fair return on its investment while protecting customers from monopoly prices. Complex cost allocation procedures resulted in the sharing of capacity costs across customer groups, over markets for different services, and between geographic areas. Postage stamp (uniform) pricing was sometimes utilized, despite cost differences in serving various locations or customer groups.

Thus, regulation influenced the number of suppliers in various markets and the prices facing customer groups. However, the optimal configuration of firms in an industry depends on the underlying basic conditions--which change over time. For example, *economies from vertical integration*, also called *economies of sequence*, change. Vertical relationships remain in some industries today--while in others, vertical disintegration has occurred. Similarly, there can be changes in the savings associated with producing several products (instead of specializing in a single product). These *economies of scope* determine whether multiproduct firms are least-cost providers of services. The familiar term, *economies of scale*, refers to declining average costs as output increases. All three economies characterized the production technologies of infrastructure industries in the past.

Figure 5 depicts a more complicated set of linkages than were described earlier. Poor industry performance affects the political conditions which alter the rules under which suppliers operate. For example, the U.S. is in a period of electricity industry restructuring, in response to changes in regulatory rules. The downside risk of change is small if relatively high prices have resulted from past private and public decisions. It is no wonder that California and New York are the top of the list for electricity restructuring initiatives in the U.S. It should be noted that regulatory changes are already changing the behavior of firms. Other feedbacks are also important. Research and development can change the feasible scale of plants and firms (e.g. combined cycle gas turbines). Advertising and promotion activity can lead to service differentiation which raises entry barriers.

Energy industries are acquiring new features -- influenced by changes in public policies. But these changes represent feedbacks -- reactions to new opportunities for cost savings or perceived problems. Prior to the 1973 OPEC crisis, utilities in the U.S. were being required to convert generating capacity to petroleum! Later, federal legislation mandated phasing out natural gas as an input. (However, again laws came into conflict with basic conditions, and the former yielded to economic realities.) During this period, nuclear proved to be more expensive than anticipated. In addition, environmental rules have affected siting and fuel use. If the past is any guide, policy-makers will miss the mark in the future (though Monday-morning quarterbacks might cultivate more humility). We must recognize that while legislators in Washington DC, London and Tokyo can influence the pace and pattern of change, the basic economic conditions will ultimately shape optimal market structure and resulting industry performance.

The changes are just as dramatic in telecommunications. In the U. S., the Federal Communications Commission is the independent regulatory agency responsible for regulating all interstate and foreign

communication by means of radio, television, wire, cable, or satellite. The FCC required common carriers to furnish service upon request and at reasonable rates. In the past, common carriers were required to file tariff schedules (lists describing services and charges) for review and regulation by the commission. The carriers had to show that all charges, practices, and classifications, and that behavior was "just and reasonable." If the commission concluded that the rates were too high or provided an excessive rate of return, it could suspend the terms of the filing. The 1996 Telecommunications Act attempts to promote competition, but the FCC still monitors the reallocation of costs of telephone service between local and long-distance customers, ensures equal access to the long-distance network, monitors the degree of competition among cable operators, and (currently) oversees their rates.

The irony is that the transition to greater competition involves new types of regulation rather than less regulation during the evolution to new industry structures. Numerous contentious issues remain: funding universal service, maintaining network interoperability, ensuring service quality, developing number portability, continuing supplier of last resort obligations, determining the appropriate extent of unbundling, and designing efficient prices for network components. The politics of regulation are such that regulators dare not withdraw from the field before they are confident that politically powerful consumer groups are, indeed, protected from the exercise of residual market power. Similarly, to the extent that policy-makers can operate as honest brokers in the development of complex contracts in vertical markets, they may be able to make the transition to competitive markets less disruptive. However, involvement in these negotiations (or dictating new supply arrangements) requires different types of regulation than in the past. To some extent, hearing rooms will continue to serve as the arbiters of outcomes -- limiting the role of the marketplace in rewarding good performance.

As some telecommunications markets become effectively competitive, incentive regulation (in the form of price caps or profit sharing rules) becomes unnecessary for consumer protection. Antitrust policies will replace regulation as the main constraint on firms. Of course, if social objectives such as universal service are not met via competition, other funding mechanisms will be needed. Aside from this caveat, competition displaces regulation as a vehicle for achieving economic objectives -- although the terms and conditions of access to network components will keep some regulators occupied for the foreseeable future. However, New Zealand has approached interconnection via antitrust rather than regulation.

The most important issue facing policy-makers is the process whereby competition is introduced into markets. For example, in the case of telecommunications, we know that local telephony, long distance, information services, television, and mobile services will be organized very differently in the future due to technological innovations and changes in public policy. The precise steps whereby incumbent firms in one industry become entrants into another will be determined by laws proposed and passed by national and state legislatures, and by rules established by the commissions. The rules will depend on the priorities established in law. Incentive regulation in markets with residual market power represents one approach to constraining firms.

Overview of Basic Conditions

It is useful to contrast the sectors in terms of the fundamental economic factors determining their industrial organization. These "basic conditions" are listed in **Figure 6**. Network infrastructure industries have some commonalities--factors influencing supply and demand determine the efficient configuration of the industry (which also must take into account any external effects). The features noted earlier were associated historically with a single supplier as being the least cost arrangement for producing the quantity demanded. Thus, economic (and political) forces lead to government involvement in these five sectors in the past.

Because of technological changes, the natural monopoly justification for regulation or public provision of these services may hold only in segments of these industries today.

Figure 6 identifies the basic conditions of five network infrastructure industries. Although we will not be considering railways in this program, it is included here to provide a contrast with other network industries. Regulation and public ownership have emerged in response to fundamental economic features of these industries, so an understanding of these features is essential to understanding the regulatory rules that affect industry structure, organizational conduct, and market performance. The key features can be divided into supply, demand, and other factors. The supply conditions basically relate to underlying production technologies and the availability of inputs. Efficiencies associated with management overseeing several stages of production have often resulted in vertical integration (implying economies of sequence). On the demand side, the size of the relevant markets and their rates of growth have a significant impact on the number of firms (or organizations) that can deliver the services in a least cost manner. That is, supply and demand conditions may be such that competition is not efficient or feasible. In addition to concerns over the exercise of market power, policy-makers might identify external effects and social concerns related to these industries. Thus, policy-makers' perceptions regarding market imperfections and market failures lead to intervention. In addition, suppliers often seek protection from potential entrants, and policy-makers utilize price structures to benefit favored customer classes. Special interest beneficiaries of entry protection, exit prevention, and pricing policies are threatened when there are changes in technologies or in public policy priorities.

The figure is a highly stylized characterization of the conditions facing the five industries. The elements will be described in greater detail in later sessions. The listing illustrates how basic conditions influence public policy in any country. If an industry can be described as a natural monopoly, then regulation is one way to obtain lower prices. However, when changes in production technologies, demand conditions, and other factors occur, we observe changes in regulatory regimes--as old rules and procedures are recognized as no longer matching the conditions of the industries. In addition, even where change has not been profound, an improved understanding of the long term consequences of ignoring key aspects of cost, demand, or traditional incentive structures has led to a re-thinking of regulation in particular industries.

Figure 7 presents schematics illustrating similarities and differences among four infrastructure industries. The basic configuration of *links*, *nodes*, and *branches* characterized all the sectors, with heavy fixed costs typically associated at each point. However, technological change and/or market growth can result in the system exhausting its potential economies of scale. Multiple suppliers make feasible *competition in the market*. Even with a natural monopoly, there can be *competition for the market*.

The figure is self-explanatory as it depicts patterns common to infrastructure industries. The details of production technologies (and of one or two-way transport), price structure, For cost recovery, and public policies are not outlined here. **Table 1** contrasts the elementary economics of infrastructure networks and retail supply. These different businesses have different capital intensities, sales stability, potential for product differentiation, market power, demand characteristics (intermediate vs. end-users), and growth potential. Managerial skills appropriate for designing and operating networks may be quite different from those required for retail supply and trade. As a vertically integrated firm focuses on one or the other business segment, corporate restructuring (and possible vertical disintegration) may prove to be necessary for profit maximization and/or to meet regulatory mandates. Other sessions will examine these issues in some detail.

Mistakes and Undue Risk Avoidance

Thus, good policy-making requires asking the right questions and having an understanding of the linkages between basic conditions, market structure, corporate behavior and industry performance. It also

involves making mistakes. The fact that we lack full information regarding key economic relationships implies that we will not choose correctly one-hundred percent of the time. Yet, policy-makers are very risk averse when it comes to making mistakes. The political penalties can be very harsh. Everyone is aware of the *Physician's Law*: "Do no harm." Another law, modestly labeled *Berg's Law*, states "Given that mistakes will be made, decision-makers will try to make mistakes that are difficult to detect." This law captures the reality of decision-making -- with important implications for good policy selection.

Figure 8 provides a statistical characterization of making mistakes. Let the basic hypothesis be H_0 the current regulatory policy is best. If this is, indeed, true, then accepting is the correct decision. If the alternative policy option, H_A is accepted, then we say a "Type I" error has occurred. This might be labeled an *Error of Commission*. If, on the other hand, we accept H_0 , and H_A is true, a "Type II" error has been made. This might be labeled an *Error of Omission*. Note that such an error of omission is difficult to detect because the consequences of continuing the current policy (rather than adopting the better policy option "A") are not dramatic. A Type I error is revealed when the "A" policy leads to worse outcomes than the previous (status quo) policy.

There are two consequences of Berg's Law: (1) decision-makers tend to keep objectives vague; and (2) the burden of proof should be on those supporting a new policy initiative. The first point is understandable, and possibly desirable. Since a clear and decisive act may turn out, in retrospect, to have unintended consequences or be inconsistent with future economic developments, policy-makers will tend to avoid the explicit prioritization of outcomes. Most decisions to change a policy have multiple impacts, so detection of a mistake is less likely if policy-makers can point to the outcome and identify its positive features as reflecting their intended objectives! Vagueness can also be a virtue since making other stakeholders aware of policy priorities can affect the bargaining power of the regulator. The second point has positive features: the burden of proof standard is reasonable for many untried policies. However, as cross-country evidence begins to accumulate regarding the positive impact of policy option "A," the probabilities of Type I and Type II errors change. The burden of proof ought to shift.

Industry performance will be affected by how regulators adapt to changes in basic conditions facing private decision-makers. We know that traditional rules or government policies from previous eras are unlikely to ensure that emerging industry structures will provide services at least cost. The real debate surrounds the types of transitional regulation suitable for this period of disruptive change. Traditionally, U.S. regulators have served as buffers -- delaying structural adjustments, but protecting some consumer groups and some suppliers from market dislocations. The operative term is some, since protectionism for some means that other customers and suppliers cannot take advantage of new commercial and technological opportunities. Other nations can learn from the U.S. experience. The tendency towards traditional regulation and protectionism arises not only because the stakeholders who benefit from the status quo understand and communicate their interest. There is the factor noted above: no one likes to make mistakes, where mistakes are defined as outcomes that are regretted in retrospect. Yet, mistakes are inevitable in a world of uncertainty; for example, an investment might have a high payoff during a business expansion, but would be regretted in a downturn. Making what turns out to be a mistake, such as investing and then discovering that a downturn is occurring, is not a "bad" decision if the firm is not unduly risk averse and if the probabilities of failure were correctly calculated at the project analysis stage. Nevertheless, each of us, whether analysts, regulators, politicians, or business executives, will try to camouflage our mistakes.

The elevation of the status quo is understandable, if misguided, for another reason. Maintaining the status quo is relatively safe. If the decision to continue current policies is incorrect, the costs are not readily visible. An example of placing different weights on sins of commission versus sins of omission is the U.S. Food and Drug Administration (FDA) rejecting a beneficial drug. It is far more costly to the bureaucracy to accept a drug that turns out to have harmful side effects than to reject a very beneficial one. The political

penalties for the two types of errors differ. In the case of regulatory agencies, a greater burden of proof is required for a policy modification in the face of changes in basic conditions (including technological developments), making it more likely that the status quo will be maintained. The costs of deciding to maintain the status quo are difficult to detect unless an efficient firm's financial viability is threatened. Of course, selecting a good policy alternative that warrants careful examination is a key factor in good public (or private) policy development. Sometimes, truly stupid policy options are considered and accepted. Such Type II errors are not to be applauded.

So how do we evaluate performance to identify mistakes and successes? Regulators and managers both need to prepare "report cards." They maintain indicators related to performance objectives. Such annual report cards on financial health and other variables provide decision-makers with information on trends. Balance sheets, income statements, cash flow statements -- all these financial statements provide an indication of financial health. An in-depth understanding of organizational performance is crucial in a time of change. Decision-makers also need to undertake diagnostic studies to understand the sources of good or poor performance.

The information sometimes points to items that need fixing. Are certain costs getting out of line? Is the distribution system well maintained? Is administrative overhead under control? Are customers satisfied with prices and other aspects of infrastructure organizations' service? Organizations need to devote staff resources to developing post audits as well as action plans. Based on the financial information, surveys, and strategic analyses, action plans are written to improve future performance. Any utility not now engaged in serious sensitivity tests of its plans is courting disaster. Similarly, regulators need to examine scenarios under alternative incentive systems.

Undergirding the report cards, diagnostics, and action plans must be a second new activity: benchmarking. Organizational performance must be evaluated relative to that of others. Who are these "others"? Regulators are going to need to publish some information so comparisons can be made. International capital markets continually make judgements about regulatory risks. Various rankings are regularly updated to take new regulatory developments into this account. Suppliers of infrastructure services face similar external benchmarking activity. Productivity measures, working capital ratio comparisons, bond ratings, current prices -- all these are relevant.

Concluding Observations

The purpose of this paper has been to provide an overview of fundamental principles that will be considered in greater depth throughout this course. The emphasis has been on the process of decision-making, especially on the conceptual framework for regulatory analysis (including the links between market structure, public policy, and industry performance). Type I and Type II Errors were distinguished to illustrate how it is difficult to go beyond the status quo. Each nation's institutional capacities and unique political structures affect the types of regulations that are most appropriate for promoting credibility for customers, legitimacy for investors, and efficiency in the economy.

We summarize regulatory lessons from the U.S. and other countries:

1. Both Economics and Politics affect the pattern of regulation and deregulation.

The historical phases of regulation (infancy, youth, maturity, and senility) point towards continued change in the energy, water, and telecommunications industries in the coming decade.

2. Economic concerns over natural monopoly in electricity have shifted to environmental and other concerns, as generation scale economies seem to have bottomed out.

While distribution to core customers will remain immune from entry for the time being, changes in transmission access regulations mean that competition can expand at the generation level.

3. Social concerns over universal service in telecommunications remain, but technological developments in fiber optics, data compression, computers, and spectrum utilization open up the industry to a wide range of potential entrants.

The emerging strategic alliances are altering the configuration of information/entertainment producers, transport firms, and local (often mobile) delivery entities. Regulatory policy-makers generally seek to protect consumers without alternative sources of supply while ensuring that the benefits of competition flow to those who successfully commercialize new services and to consumers who desire those services.

4. Traditional infrastructure industries are much more at the mercy of external forces than in the past.

The socioeconomic conditions affecting business processes reflect underlying production technologies and input markets (financial capital, people, plant/equipment, and raw materials) and demand conditions (customers). These external forces are changing dramatically, which complicates the development of sound regulatory policies.

5. In particular, the political environment greatly affects the nature of regulation.

Federal, state, and local regulations constrain infrastructure service providers in different ways than in the past. The media, environmental advocates, civic groups, and attitudes of the general public influence the political process to shape policy.

6. Traditional regulation in the U.S. was a highly choreographed process, wherein various rate-making objectives were sought after through a process involving formal hearings and a variety of regulatory procedures.

The traditional objectives focused on revenue sufficiency and fairness, with cost containment encouraged by disallowances, reviews, and adjustments to the allowed rate of return.

7. Rate of return on rate base regulation involved adding up cost components to achieve overall revenue requirements.

Prices for different customer groups were set using cost allocation procedures. Prices were determined from the bottom up.

8. Today, prices and investments are also constrained by competition -- induced both by regulatory promotion of alternative suppliers and by changes in fundamental economic conditions.

Price is determined exogenously in non-core markets -- so revenues from some customer groups will fall short of "allocated" costs. Core customers can flex their political muscle to avoid rate increases. Realized returns become a residual.

9. Industry structure and strategy depend on basic economic conditions and the political environment.

The political process and industry fundamentals determine regulatory policies. These policies can alter

industry structure and corporate behavior.

10. In the past, demand growth and technological innovations resulted in a "public utility" where there was no fear of outside entry, the service was undifferentiated, and firms were vertically integrated.

Regulation defined markets, cost of service regulation determined price, and production processes were determined by utility planners.

11. Holding companies have responded to competitive pressures by adopting comprehensive cost-containment programs; regulators are moving to greater use of incentive regulation.

In electricity, slow growth and the exhaustion of scale economies affected capacity additions; but regulatory rules tend to promote competition through capacity bidding procedures, access to transmission, and the emergence of cogeneration and independent power producers. In numerous jurisdictions, conservation is being mandated through aggressive demand-side management. Environmental considerations are affecting the generation mix and site selection.

In telecommunications, down-sizing has been dramatic, as incumbents seek to prepare for competition. Innovations have led to corporate diversification across technologies and services. At the state and national level, deregulation is promoting multiple centers of initiative through the unbundling of services, although terms and conditions of access to local exchange services (interconnection) remain a highly contentious issue.

Addendum on the Political Economy of Regulation

The main purpose of this paper was to provide an overview of the fundamentals of economic regulation. Achieving social objectives still involves economic costs -- whether in terms of taxation or foregone opportunities. So the previous sections emphasized the kinds of economic trade-offs that need to be considered when addressing social issues. This Addendum explores the political economy of legislative or regulatory initiatives. Some of these points have been anticipated in previous sections, but they are considered as an Addendum in recognition that these ideas are probably more controversial than those presented earlier

It has been argued that the study of economics makes one politically conservative (Stigler, 1959). Whether skepticism with regard to government intervention is healthy (or not) is partially a matter of taste. However, many who evaluate public programs find that government intervention is often counterproductive and leads to inefficiencies and transfers of wealth that benefit the powerful. Not only is redistribution via intervention (taxation via regulation) viewed as generally benefiting wealthy groups, but also it induces price distortions that create inefficiencies. While market imperfections and failures are often viewed in the popular press as requiring government corrective action, citizens are gaining an awareness of government imperfections and failures.

Markets have strengths and shortfalls, with substantial analysis directed towards circumstances where intervention can improve resource allocation. For example, monopoly analysis has identified the misallocations and wealth transfers associated with the exercise of market power. Similarly, international trade theory has formalized conditions under which protective tariffs for "infant industries" make sense. Nevertheless, technically-trained analysts who are well-grounded in historical experience tend to be skeptical of "statism" (excessive intervention).

Economists have documented how transaction costs, information asymmetries, and property rights

issues constrain private decision-making. These circumstances also limit the effectiveness of government decision-making. As Gordon (1994, p. 109) states ". . . .many arguments for intervention overstate the problems of efficient private organization and understate the drawbacks of government." He is particularly skeptical of those who let sincerity and fervor substitute for careful cost-benefit analysis when considering policy options. As a conservative economist, he views managed markets as comprising a slippery slope on the way to comprehensive intervention. From this perspective, benign neglect can be the best way to address the crisis of the week. Often, unrealistic political expectations combine with the influence of special interests to exacerbate the situation (e.g. U.S. energy policy in the 1970s). There is no doubt that intervention often protects established groups at the expense of innovative newcomers.

Based on these observations, three "laws" of political economy can be identified. None has the force (or scientific basis) of the Law of Gravity, but they warrant more attention from policy-makers.

First Law of Political Economy:

No new law is promoted on the basis that it benefits the powerful.

A corollary to this Law is that sponsors of new legislation will advocate it on the basis of promoting the public interest and general welfare, increasing fairness, and/or enhancing opportunity. That these laudable objectives are hard to quantify does not make them irrelevant. However, the lack of specific targets associated with the public interest makes it difficult to halt a new program that is actually ineffective. Without a clear test regarding success or failure of a program, it is likely to continue for an unreasonable period of time.

Second Law of Political Economy:

The powerful are seldom worse off after a new law has passed.

In a sense, this point is tautological. If a group is directly (or even indirectly) harmed by legislation, then it could not muster the votes to block passage--implying that the group lacked power. Yet, the point is still important. Since most legislation is supported by claims at promoting the "social good", the implementation of the new law is not likely to harm those who are politically powerful. For example, in some cases, groups can be galvanized into more political action, by joining an existing coalition -- to resist further legislation.

The fundamental corollary to the Second Law is that laws ought to focus on enhancing efficiency. Otherwise, laws involve zero-sum games. That is, since the powerful are not harmed, a new law will tend to redistribute benefits among others: some are winners and others are losers. Such relatively random sets of transfers are unlikely to be legitimately categorized as "in the public interest" or as enhancing fairness. Improvements in efficiency expand the production possibility frontier -- making more output available for those who are not powerful - without harming those who are powerful.

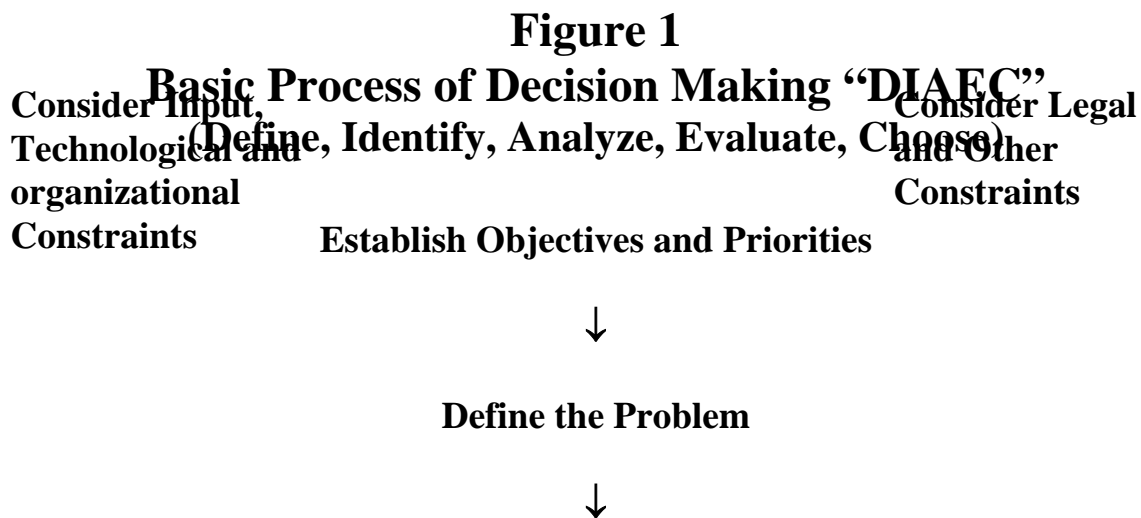
Based on the above discussion, laws not aimed at promoting efficiency (expanding production and consumption possibilities for the economy) either benefit the powerful and hurt others or have no net positive impact. Valid justifications for intervention are often misapplied in practice. The design and implementation of sound policies recognizes the tendency of bureaucracies and special interests to dominate the process. The passage of legislation dissipates whatever forces were addressing some issue, thereby delaying the passage of a truly beneficial or effective law-- one that creates net gains.

Third Law of Political Economy:

Policy-makers who concentrate on laws and regulations that promote efficiency also promote the potential achievement of other social objectives.

The Third Law is essentially one that supports specialization and an appropriate division of labor among government agencies (See Schmalensee, 1979, for a more comprehensive argument on this point). From this perspective, regulatory agencies should focus on expanding society's capabilities to address issues.¹ Social welfare agencies then have the responsibility for dealing with the income distribution and other concerns. Objectives such as regional development fall between these points on the spectrum, since they involve tax and transfer activities but are supposed to focus on expanding the productive capabilities of a geographic region (though at the expense of some expansions that would have occurred elsewhere).

Programs that create wealth make it easier for us to address other concerns, including the distribution of wealth across individuals, social groups, industries, and geographic areas. If new capabilities are not created as a result of a law--such as one that changes incentives--then the law has essentially stimulated the "churning" of wealth². The attendant protective measures taken by those who might be affected by such legislation is a drag on the economy. Resources are reallocated to unproductive rent-seeking activity as public and private special interests attempt to manipulate the political process. The cumulative effect of such activities can be very harmful to society.



¹Note that I emphasize addressing rather than solving issues. If there is a social concern related to infrastructure access and pricing, then no single law or policy will solve the problem. Given the interdependent nature of the modern economy, new mandates induce side effects. Other objectives are compromised, and new legislation is proposed in reaction to these developments. No real problems are ever solved--we just deal with them!

²Both producer protection and consumer protection can occur in this competition for legislative favors. A general theory of political rent-seeking activity has emphasized rent creation (Tollison, 1982) and rent extraction (McChesney, 1987), where both can involve misallocations. The economic theory of (or explanation of) regulation is based on these types of observations.

As Machievelli wrote: "There is nothing more difficult to carry out, nor more doubtful of success, than to initiate a new order of things. For the reformer has enemies in all those who profit by the old order." It is easy to conclude that efficiency-enhancing reform is not easy to carry out.

**Identify Possible options (solutions)
and organizing concepts**



→ Analyze each Option ←



**Evaluate each option in terms
of impacts on objectives**



**Choose the best possible solution given
the weight for each objective**



Implement the Decision



Evaluate Decision at Later Date

**Figure 2
Organizing Concepts**

Markets-Basics of Supply and Demand

Profits from Innovation, risk bearing, and market power

Technological Constraints and Opportunities

Demand Patterns

Incremental Benefits

Incremental Costs

Transaction Costs

- Coordinate costs – Search and Exchange
- Motivation Costs/Problems
- Information Incompleteness and Asymmetries
- Imperfect Commitment and Opportunism

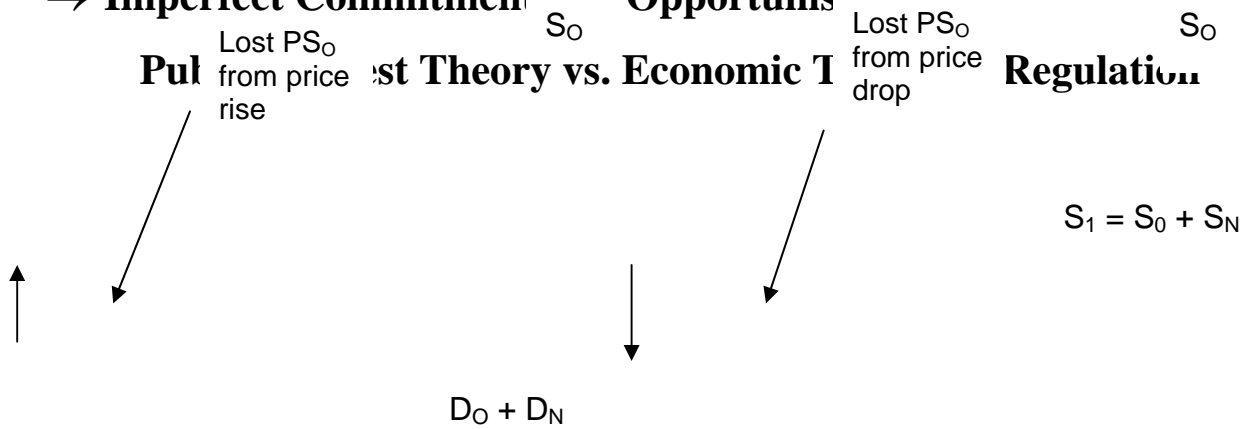
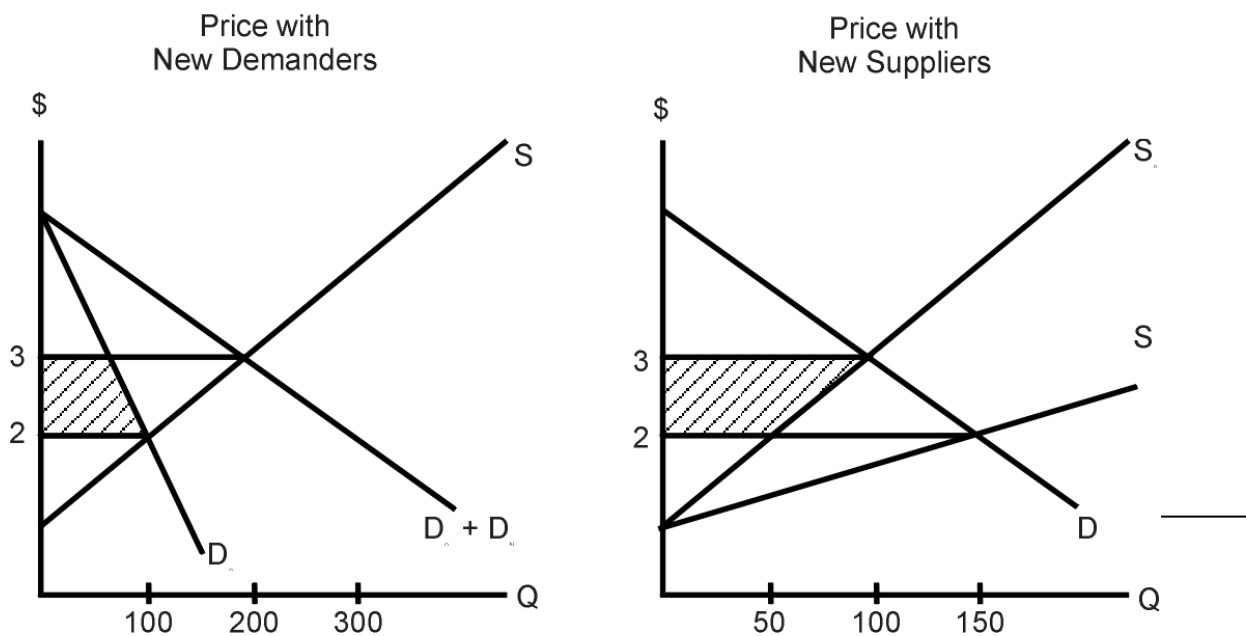


Figure 3
Impact of Entry



Consumer surplus (CS)

- The area under the demand curve and above the market price.

Producer surplus

- The producer's operating profit. The area above the supply curve (i.e., LRMC) and under the market price.

Deadweight loss

- The value of an economic exchange that is lost to the consumers and/or producers when a good or service is improperly priced. This occurs when pricing is not at incremental cost and results in resource misallocation and reduction in economic efficiency.

Figure 4 **Traditional Features of** **Network Infrastructure Industries**

BASIC CONDITIONS

Economies of	Demand Patterns
Scale	Price
Scope	Income
Sequence	Demographics

TRADITIONAL STRUCTURE

Regulatory	No Entry
Defined	Public Utility
Markets	Vertical Integration

TRADITIONAL BEHAVIOR

Cost-of-Service
Regulation

Price-Regulation
Production Process

TRADITIONAL PERFORMANCE

Rate of Return
on Rate Base

Technological Advance

Fair Return on Investment

Cost Allocation
Manuals

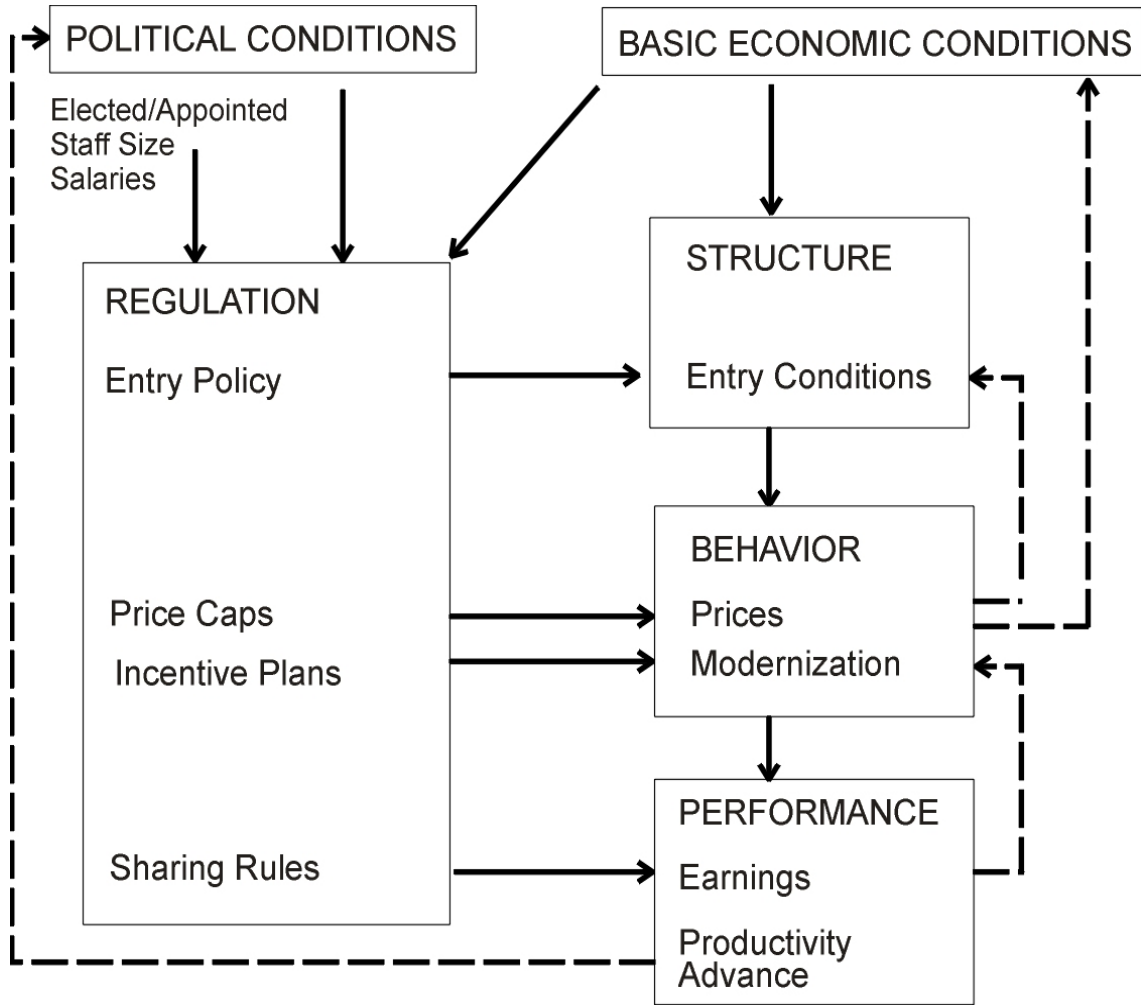
Prices Based on Cost
Allocations

Geographical
Averaging

Universal Service

Figure 5
Chains of Causation:
Regulation, Behavior and Performance

Figure 6
Basic Conditions of Five Network Industries



-) Performance = f (Regulation, Economic Conditions, Structure, Behavior)
-) Behavior = g (Regulation, Economic Conditions, Structure)
-) Regulation = h (Regulation, Economic Conditions, Political Conditions)

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	Telecommunications	Electricity	Natural Gas	Railways	Water
Supply					
Technological Change	High	Low	Low	Low/Medium	None
Stages of Production	Distribution Network Switching Transport	Generation Transmission Distribution	Production Transport Distribution	Routes Nodal Switching Rolling Stock	Withdrawal Transmission Distribution Treatment
Demand					
Demand Growth	High	Low	Medium	Low	Low
Markets	Local Service Long Distance Enhanced Services	Residential Commercial Industrial	Residential Commercial Industrial	Passenger Freight	Residential Commercial Industrial Agricultural
Other Factors					
Externalities	Spectrum Networks	Environment	Environment	Highway Congestion	Environment Property Rights
Social Concerns	Universal Service "Basic Service" Definition Freedom of Speech/Privacy	Necessity	Residential Priority	Low Density Markets	Necessity Health/Safety

Figure 7
Schematics of Networks

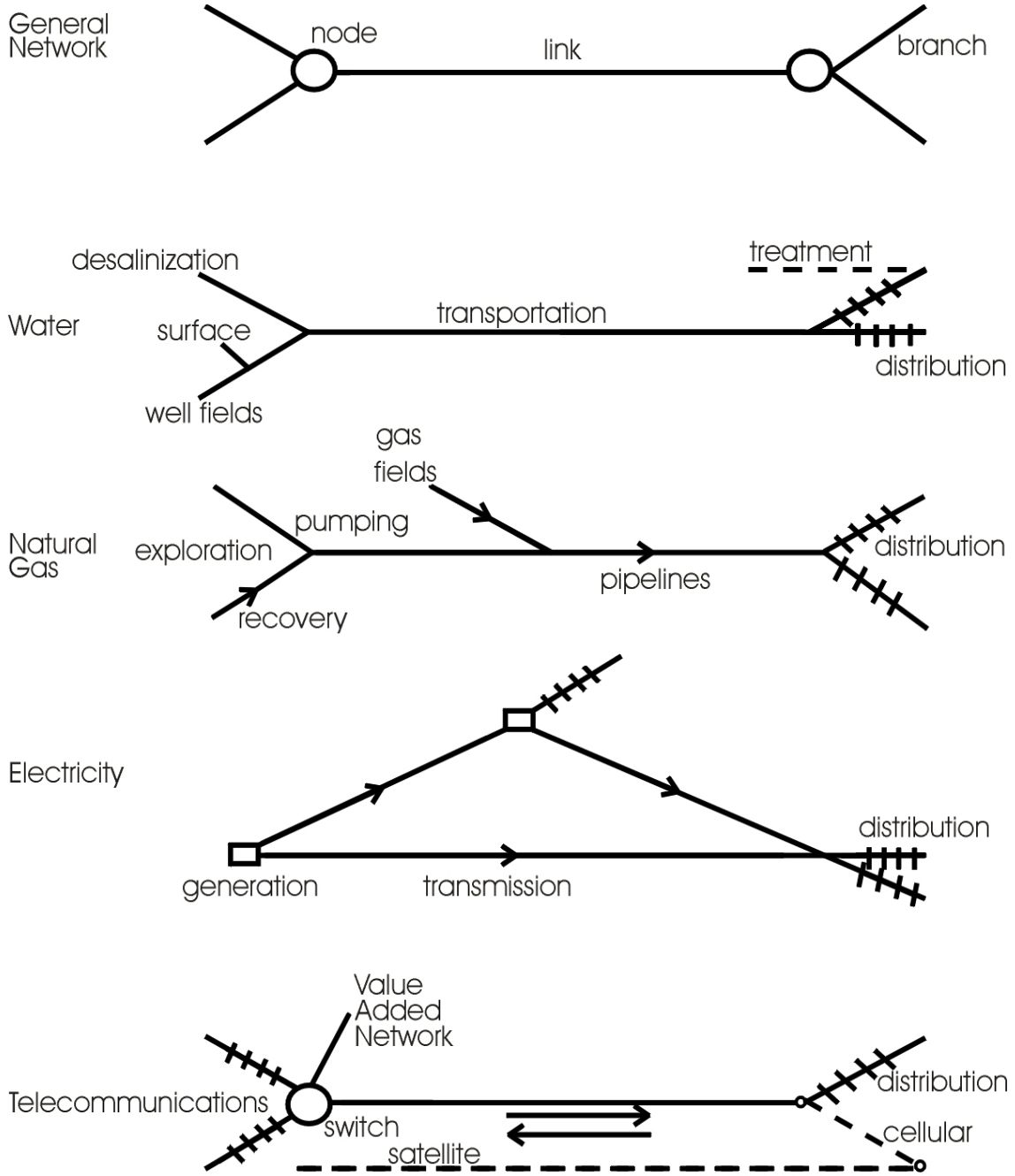


Figure 8
Making Mistakes

	H_0 is True	H_A is True
Accept H_0	Correct Decision	Type II Error
Accept H_A	Type I Error	Correct Decision

H_0 : Current policy is “best”;

H_A : Alternative policy option “A” is “best”.