

**OPTIMAL SCREENING OF INDUSTRY RESTRUCTURING PROPOSALS**

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## EXECUTIVE SUMMARY

Presently, many regulators and legislators are actually engaged in restructuring the electricity industry. The policy that they make will determine how electricity is produced and delivered for years to come. However, neither knows with certainty who will gain or lose from their efforts. This uncertainty causes them to be suspicious of each other and everyone else. Suspicions, in turn, elicit noncooperative behavior as they attempt to sort out the issues associated with industry restructuring. Consequently, the transition to more competitive markets is a contentious affair.

No one should find it surprising that industry restructuring is a hotly debated topic among regulators and legislators. The stakes are very high, and it is unfathomable that either group would allow the current structure to go softly into its good night. There are subsidies to be protected or redistributed, and there are profit-making opportunities to be granted or withdrawn. There are entry barriers to tear down or redesign. There are the necessary precautions to ensure that restructuring does not result in higher prices for electricity services. There are the safeguards that have to be put in place to ensure that the quality of electricity service will not deteriorate as a result of the lower prices. There are unjust rates and undue price discrimination that have to be avoided.

Typically, legislators and regulators negotiate to win support for particular policy positions. The analysis supporting these negotiations can be difficult to follow because preferences are rarely revealed fully to opponents. The reason is that strategic advantages can be won by holding something back. For example, it is often productive to argue strongly in favor of a position that will be relinquished at later time, if there is reason to believe that this “throw-away” can be exchanged for a desired concession from the other side. Therefore, the negotiations between legislators and regulators concerning industry restructuring have to be viewed as contributing to the contentious nature of this process.

In this paper, industry restructuring is examined using a three-stage, noncooperative process under an incomplete payoff structure. Incompleteness is introduced by assuming that legislators and regulators do not know the payoffs that the other will receive after a restructuring proposal is actually implemented. Noncooperation refers to the structure of the *strategic interaction* between them. In particular, it is assumed that they are not acting jointly to solve the problem of restructuring the electricity industry.

The initial stage of the process is characterized by workshops and general discussions of the “pros and cons” of industry restructuring. At this time, legislators and regulators stake out their “guiding principles” and present “wish lists” as to what they expect to achieve as a result of their efforts. In the intermediate or “screening” stage, they independently evaluate the restructuring proposals that have been submitted by the various special interests. These evaluations represent a culling process that is sufficiently robust to eliminate some proposals from further consideration. Unanimity is the criterion that is used to cull the submitted proposals. This criterion ensures that only proposals acceptable to legislators *and* regulators are forwarded to the final stage of the process. The final stage is the selection of a proposal for implementation.

The purpose of the paper is to provide legislators and regulators with analysis and means that they can use to identify acceptable proposals during the screening stage of the process. The motivation for this effort is that the efficient culling of submitted proposals greatly facilitates the selection phase. The choice of unanimity as the culling criterion rests on the belief that effectively participating legislators and regulators should never be outright losers at the end of the restructuring process. At worst, they should be convinced that their future benefits will outweigh their current costs.

However, the absence of outright losers is assured only when it is impossible for legislators *or* regulators to unilaterally impose their wills on the other. Obviously, this limitation exists only when they are true countervailing forces. More precisely, a necessary condition for the screening stage to produce “win-win” outcomes is that it cannot be dominated by either group. This condition is met when legislators and

regulators have vetoes that they can use to eliminate particular restructuring proposals from further consideration. However, vetoes do very little to control the administrative costs of a restructuring process. An exercised veto simply indicates that the proposal is not acceptable at a specific point in time. Therefore, a necessary condition to realize “win-win” outcomes at a *reasonable cost* is that proposal culling occurs in the context of a stable industry structure.

The legislators’ and regulators’ acceptance or rejection of a restructuring proposal is dependent on the circumstances that exist at the time that their evaluations are completed. If the circumstances defining the industry structure are allowed to vary by time period, then a restructuring proposal that was found to be unacceptable under a prior industry structure could very well be acceptable under the current structure. As a result, every restructuring proposal that previously had been evaluated would have to be re-evaluated each time the industry structure changed. Hence, an unstable structure severely disrupts the process.

A condition ensuring a stable industry structure is the persistence of the *status quo*. Precisely speaking, an industry has been restructured when its circumstances are altered even a little bit. So, the *status quo* must persist if the industry structure is to be stable during the screening stage of the restructuring process. The existence of this condition is assured by assuming that legislators and regulators cannot unilaterally select a restructuring proposal for implementation. Hence, neither group can unilaterally change the industry structure.

This paper contains three important results for legislators and regulators actively engaged in restructuring the electricity industry. First, the persistence of the *status quo* and vetoes are necessary and sufficient conditions for “win-win” outcomes as a result of proposal screening; that is, they ensure that only unanimously accepted proposals will be forwarded for possible implementation. This result suggests that regulators and legislators may have to create ways to keep the *status quo* in effect as pressures on the *status quo* change during the restructuring process.

Second, vetoes introduce a large dose of consistency into the process. Each restructuring proposal is either rejected outright by legislators and regulators, blockaded by either of them, or accepted by both. Thus, neither of these groups is

obligated to sway the opinions of the other if they want to kill a proposal. As rejections and blockades pile up over time, the new proposals that they breed should come closer and closer to yielding positive net benefits for them.

Third, “win-win” outcomes are identified during the screening stage only when legislators and regulators conclude, in isolation and simultaneously, that they expect to receive positive net benefits over some suitable time horizon. This result has some interesting implications for the special interests submitting restructuring proposals. They have to be cognizant of the political and economic needs of legislators and regulators, even as they behave noncooperatively among themselves. If any industry restructuring is actually to take place, they have to create an environment where they spend some resources on balancing the interests of regulators and legislators over a suitable time frame.

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## FOREWORD

The two major groups of players, representing many and various constituencies, in the restructuring of the electric industry are regulators and legislators. Their approaches often differ, and deviations from the status quo necessarily result in gainers and losers. This study frames the interactions of regulators and legislators in the context of negotiation theory on the assumption that they are not acting jointly to solve the problems of electric industry restructuring. Insights gained should be useful to all participants in this process, the outcome of which will largely determine the future of the electric sector.

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## INTRODUCTION

The restructuring of regulated industries represents the relentless pursuit of the efficiencies of competition. The economic history of the telecommunications industry is a testimonial in this regard.<sup>1</sup> Similarly, there are many documented events associated with restructuring that increased the economic efficiency of the natural gas industry.<sup>2</sup> It appears that the current events that will soon comprise a chapter in the economic history of the electricity industry indicate steady movement towards more economically efficient wholesale and retail electricity markets.<sup>3</sup>

The capture of efficiency gains through more competition has had to overcome a strongly held belief among legislators and regulators that regulated industries are characterized by economies of scale.<sup>4</sup> While this belief was being dismantled, the mystique of vertical integration helped to keep prices in these industries higher than they had to be and production lower than it had to be. Obviously, this state of affairs irritated large-volume customers. In response, they orchestrated grass roots

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<sup>1</sup> John R. Meyer, Robert W. Wilson, M. Alan Baughcum, Ellen Burton, and Louis Caouette, *The Economics of Competition in the Telecommunications Industry* (Cambridge, MA: Oelgeschlager, Gunn & Hain, Publishers, Inc., 1980). Alvin von Auw, *Heritage & Destiny: Reflections on the Bell System in Transition* (New York: Praeger Publishers, 1983). Gerald W. Brock, *Telecommunications Policy for the Information Age* (Cambridge, MA: Harvard University Press, 1994).

<sup>2</sup> David B. Hatcher and Arlon R. Tussing, *State Regulatory Challenges for the Natural Gas Industry in the 1990s and Beyond* (Columbus, OH: The National Regulatory Research Institute, 1992). Daniel J. Duann, *The FERC Restructuring Rule: Implications for Local Distribution Companies and State Public Utilities Commissions* (Columbus, OH: The National Regulatory Research Institute, 1993). W. Kip Viscusi, John M. Vernon, and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust* (Cambridge, MA: The MIT Press, 1995): Chapter 18.

<sup>3</sup> Kenneth Costello, Robert E. Burns, Daniel J. Duann, Robert J. Graniere, Mohammad Harunuzzaman, and Kenneth J. Rose, *A Synopsis of the Energy Policy Act of 1992: New Tasks for State Public Utility Commissions* (Columbus, OH: The National Regulatory Research Institute, 1993). Kenneth W. Costello, Robert E. Burns, and Youssef Hegazy, *Overview of Issues Related to the Retail Wheeling of Electricity* (Columbus, OH: The National Regulatory Research Institute, 1994).

<sup>4</sup> Herbert G. Thompson, David Alan Hovde, Louis Irwin, Mufakharul Islam, and Kenneth Rose, *Economies of Scale and Vertical Integration in the Investor-owned Electric Utility Industry* (Columbus, OH: The National Regulatory Research Institute, 1996).

movements to restructure their industries. Not surprisingly, their objective was to obtain lower prices for the services that they purchase from regulated utilities.

In general, large price differentials were not required to induce large-volume customers to campaign vigorously for industry restructuring. Perhaps, the reason is that regulators always have shown the proper respect for pricing and its effects on the well-being of these customers. For example, special contracts, economic development rates, and volume discounts have been part of regulatory rate making for some time. These pricing practices tend to provide economic benefits only to large-volume customers. In turn, this respect has allowed legislators to have the opportunity to consult their constituencies before they take decisive action to restructure regulated industries. The information that they have received through their consultive processes permits them to build deliberate cases for or against industry restructuring. As a result, the legislators' general tendencies have been to gradually restructure regulated industries.<sup>5</sup>

The gradual restructuring of regulated industries rises or falls on how effectively legislators and regulators buy time to gain control of the agenda.<sup>6</sup> Phasing-in complementary restructuring proposals is a way to achieve this objective.<sup>7</sup> However, this mechanism for accruing industry-wide support favors restructuring proposals with short-term gross benefits over longer term proposals with higher net benefits.<sup>8</sup> This

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<sup>5</sup> The government can resort to "Big Bang" approaches when the conditions creating the need to restructure an industry are extreme. See, J. Williamson, ed., *The Political Economy of Policy Reform* (Washington, D.C.: Institute for International Economics, 1994). These approaches rest on the government's ability to implement its restructuring proposal without building a case that supports the restructuring. See, J. Sachs, *Poland's Jump to the Market Economy* (Cambridge, MA: The MIT Press, 1993). Hence, California's restructuring effort is not an example of the "Big Bang" approach. The regulators in this state have taken a great deal of time to construct a consensus proposal for the restructuring of the electricity industry.

<sup>6</sup> M. Dewatripont and G. Roland, "Economic reform and dynamic political constraints," *Review of Economic Studies* 59 (1992): 703-30.

<sup>7</sup> M. Dewatripont and G. Roland, "The design of reform packages under uncertainty," *American Economic Review* 85 (1995): 1207-23.

<sup>8</sup> The justification of the preference for the short term rests on two pylons. First, the short term often represents the only time frame where policy makers have some assurance that their restructuring proposals will achieve actual economic gains. See, D. Rodrik, "Understanding economic policy reform," *Journal of Economic Literature* XXXIV (1996): 9-41. Second, current policy makers prefer the more costly short term because they are not convinced of the cooperation of future policy makers. See, A. Alesina and G. Tabellini, "External debt, capital flight and political risk," *Journal of International*

paper examines what happens when regulators are provided with vetoes over restructuring proposals that are submitted to them by special-interest groups. These proposals are assumed to contain identifiable economic gains and losses that are measurable from the legislators' and regulators' perspectives. Because it is assumed that they experience these gains or losses in a relatively short time after the actual implementation of a restructuring proposal, it is unnecessary to assume that the realization of these benefits and costs depends on the cooperation and support of future legislators and regulators. Section 1 provides the legislative and regulatory profiles that are used in the analysis. Section 2 presents a model of the "screening" stage of a process that ultimately results in the selection of a restructuring proposal for actual implementation. Section 3 describes a solution and other multiple equilibria for the screening stage of the proposal-selection process.

## LEGISLATIVE AND REGULATORY PROFILES

Legislators and regulators are among the most prominent government officials engaged in the restructuring of the electricity industry. Their interests in this activity are derived from their concern about the influence of electricity prices on interstate or international competitiveness. For the most part, they believe that lower electricity prices will make the United States or their individual states more capable to sustain economic growth. Most often, they envision an electricity industry that is restructured to be more competitive as the means to achieve the lower prices that they seek.

The prize of low prices through competition is made possible by a set of facts that characterize an allied industry. The first fact is that natural gas is an economically viable fuel for the generation of electric power. Its proven reserves appear to be adequate for this purpose, and its price is competitive with the price of coal. The second fact is that the fewer environmental concerns associated with gas-fired generation make gas-burning technology superior to coal-burning technology, if cost is

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*Economics* 27 (1989): 199-220. A. Cukierman, S. Edwards, and G. Tabellini, "Seigniorage and political instability," *American Economic Review* 82 (1992): 537-55.

not a consideration. The third fact is that the high cost of nuclear power in relation to coal-fired generation makes gas-fired generation look even more inviting to anyone desiring lower electricity prices. The fourth fact is that gas-fired generation is not burdened with the waste disposal problems that characterize the generation of power using nuclear fuels. The glue holding all of these facts together is the technological breakthroughs that have lowered the cost of gas-burning technologies to the point where their average costs often are less than the average costs of electricity generated from coal or other fuel sources.<sup>9</sup> Therefore, the prize of lower electricity prices is within reach, if only new combined-cycles gas technologies could penetrate the generation market quickly.

The conventional wisdom is that new technologies tend to be deployed most rapidly in competitive markets. The supporting argument *a la* Schumpeter is that a monopoly cannot be relied upon to force out old inefficient technologies as long as the monopolist can maintain the existing entry and exit barriers.<sup>10</sup> Thus, the typical public policy solution to the problem of accelerating the penetration of a new technology is to lower or eliminate entry barriers.<sup>11</sup> When applied to the electricity industry, this solution clears a path for the cost-reducing, combined-cycle gas turbine technology.<sup>12</sup>

However, legislators and regulators often have different opinions with respect to how quickly these entry barriers should be removed or lowered. That is, they differ with respect to the speed at which the electricity industry should become competitive. Some

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<sup>9</sup> I.M. Stelzer, "The regulators' poison'd chalice," *The Electricity Journal* 10 (3) (1997): 20-28, 83.

<sup>10</sup> J.A. Schumpeter, *Capitalism, Socialism, and Democracy* (New York, NY: Harper Calophon, 1942).

<sup>11</sup> As a brief aside, it should be noted that the removal of entry barriers to open the door for new technology does not guarantee lower prices. The competitive advantage of the new technology may be to enhance service quality or to increase the number of available services. This possibility should be kept in mind by regulators and legislators who view technology-driven technologies as their salvation from high electricity prices.

<sup>12</sup> It would be interesting to know what legislators and regulators would do if the transition to competition in the electricity industry was characterized by new technologies that increased the cost of electricity. At present, the near obsession in the electricity industry with costs and prices suggests that lower prices would receive more votes than more services and better service quality. As a recent article reveals, legislators and presumably regulators are very hesitant to support industry restructuring if they believe that higher prices would be the outcome. See P. Kemezis, "Deregulation: Its not a done deal," *Electricity World* May, 1997.

of them may want a rapid transition because they need immediate relief from upward price pressures. Others might want to ease into a new industry structure because the current price pressures are manageable. Still others may profess mild support for the *status quo* because the existing prices are acceptable to the consumers that comprise their constituencies. Finally, there may be some legislators and regulators that will defend staunchly the *status quo* because existing prices are low. In a very intuitive sense then, the restructuring of the electricity industry, in hopes of winning the prize of lower prices, is being carried out in part by government officials with differing opinions as to the speed at which lower prices should be realized.

However, it is risky business to proceed with the restructuring of the electricity industry solely on the promise of lower prices. Whether or not price reductions are actually realized as a result of the transition to more competition, legislators and regulators have to deal with the equity and fairness issues that are raised by the tendency of formerly regulated firms to turn to price discrimination more openly during the transition to more competitive markets.<sup>13</sup> Surely, they will be second-guessed as to the wisdom of a transition to competition, if said transition results in higher prices for those classes of customers with fewer choices. As a result, they always are concerned about the effects of the transition on those consumers who cannot freely switch their electricity suppliers.

The differences of opinion among regulators and legislators ensure that neither group will agree to the implementation of an unmodifiable restructuring proposal as long as they believe that there is more to be won for their side. Thus for many restructuring proposals, either the legislators or regulators may want to implement them immediately. There will be proposals however where either group wants to search around a bit more before anything is implemented. Also, there will be proposals where either group or both groups want to reject them. Hence, the differing opinions among legislators and regulators establish the basis for a noncooperative game, if legislators and regulators *cannot impose their will* on each other.

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<sup>13</sup> E.E. Zajac, *Fairness or Efficiency: An Introduction to Public Utility Pricing* (Cambridge, MA: Ballinger Publishing Co., 1978).

The reality of public utility regulation indicates that neither the legislators nor the regulators hold the upper hand during the transition to competition. On the one hand, legislators control the regulators' purse strings and pass laws that the regulators must implement. On the other hand, regulators control the characteristics of the rules and regulations that are required to implement the laws and the effort that they expend to accomplish the tasks that are mandated in the laws. Thus, the elements are in place for a classic principal-agent struggle with the legislators as the principals and the regulators as the agents. All that is required is evidence that legislators do not perfectly monitor and interpret the behavior of the regulators.

The essence of the principal-agent problem, as it pertains to industry restructuring, is that the legislative objectives to be accomplished by the transition to competition are not necessarily the same as the regulatory objectives that are expected to be accomplished during the same transition. The legislators are apt to be concerned mostly with lower prices and economic growth. These outcomes are good for the state's economy and the political futures of legislators. In addition, economic growth and lower prices are easily tracked, and they are often attributable to industry restructuring.<sup>14</sup> Meanwhile, regulators are most likely to be concerned with how restructuring affects service quality, price discrimination, and service availability. At the most practical level, they will surely hear complaints from consumers and their advocates when industry restructuring causes declines in service quality, undue price discrimination, and reduced service availability. Complaints in these areas oppose the primary principle that has long guided regulatory behavior. Historically, regulators have sought to fairly balance price and quality levels. In general, they have been able to uphold this principle over the years. Surely, they cannot be expected to abandon it for the purpose of merely making a regulated industry more competitive.

In terms of the traditional role of regulation, regulators are justified in placing their objectives on the list to be accomplished as the electricity industry is restructured to be more competitive. What legislators have to protect against then is that the regulators' desired outcomes do not dominate their desired outcomes. They can obtain

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<sup>14</sup> K.W. Costello and R.J. Graniere, "The outlook for a restructured U.S. electric power industry: Lessons from deregulation," *The Electricity Journal* 10 (4) 1997: 81-91.

the required protection by providing regulators with a means to optimally balance their needs with the lower prices and the promotion of economic development that are desired by the legislators. The means suggested in this paper is that the legislature provides regulators with a *veto* that is exercisable only during the proposal-screening stage of the restructuring process. In this way, regulators are assured that a restructuring proposal, which is implemented in hopes of lower prices and economic development, will not undermine the traditional regulatory objectives.

Since the regulators would be able to veto any proposal supported by the legislators, the legislators should be satisfied as long as the restructuring of the industry results in lower prices and more economic growth. While they would like to see prices as low as possible and economic growth as high as possible, the regulators' veto prevents them from achieving these objectives at the expense of service quality and service availability among other things. Because the legislature could always blockade a regulator-supported restructuring proposal, the regulators are satisfied as long as service quality does not deteriorate; existing services are not discontinued without replacements; price discrimination remains within acceptable bounds. In effect, by putting regulators on equal footing with legislators during the screening stage of the proposal-selection process, the veto establishes the *mutual net-gain criterion* (i.e. legislators and regulators gain from industry restructuring) as a sufficient condition for a solution to this stage of the noncooperative game.

The inclusion of the mutual net-gain criterion as part of the profiles of legislator and regulator behavior reflects the realities of actual industry restructuring processes. Legislators and regulators are not members of a homogeneous group, and their differing perspectives as to what is most important sometimes put them at odds with each other. Furthermore, they both have some sway over the outcome at different stages of the restructuring process to differing degrees. Even when the legislature has mandated the restructuring of the electricity industry, this does not mean that the regulators did not have some influence over the structure of the mandate at an earlier time. Finally, both groups seldom have the power to unilaterally impose a specific form of restructuring on an industry.

Legislators and regulators estimate the gain or loss associated with an industry restructuring proposal on the basis of its value, cost, and risk to them. If they are risk averse or risk neutral, they believe that a proposal yields a net gain to them when its implementation is expected to result in a positive payoff. Of course, it follows then that a net loss for legislators or regulators is associated with an expected negative payoff. Thus, rational risk averse (risk neutral) legislators and regulators are sure to accept a proposal as a candidate for future implementation when it is associated with net gains for both of them.

### MODEL OF THE SCREENING STAGE

It is convenient to divide the process of restructuring an industry into three stages. Workshops and other informal and formal means of information gathering comprise the initial stage of the process. The outcome of these informational efforts is that legislators and regulators stake out their positions. The screening stage begins with the submission of restructuring proposals. Some of these proposals may be modified versions of other proposals in the sense of their details; however, they are considered as separate and distinct proposals for this stage only if their payoffs are different. The *status quo* remains in effect while the legislators and regulators evaluate the submitted proposals. The process moves into the final stage after the proposals have been screened.

This model describes the screening stage in the specific context that information is not fully disclosed during the initial stage. Even though substantial amounts of information are exchanged at the beginning of an industry restructuring process, it is accomplished at public forums, sponsored conferences, informal telephone calls and e-mail messages. Legislators and regulators do not as a rule invite each other to their closed planning sessions, where they develop their strategies for attacking or defending particular types of restructuring proposals.

Exclusion from each other's planning sessions means that legislators and regulators do not have any opportunities to candidly communicate with each other before they announce their reaction to a restructuring proposal. As a result, they do



not possess the information that is necessary for obtaining an understanding of why particular offensive or defensive strategies are selected over other strategic possibilities. Thus, they lack secure foundations for accurately predicting each other's behavior in the screening stage. Hence, legislatures and regulators have to choose their screening strategies without any real knowledge of what each other is doing.

The motivation for the explicit modeling of the screening stage is that the act of selecting a restructuring proposal for implementation is optimal only when proposals acceptable to both legislators and regulators comprise the output of the screening stage. Unanimity is a necessary condition for optimality because neither legislators nor regulators have imposed their wills on the other. However, unanimity cannot occur without a support that ensures that the regulated markets continue to function smoothly as the restructuring process goes through its three stages. The support used in this model is the persistence of the *status quo*.

The *status quo* is not easily undone because the behavioral profiles for legislators and regulators do not permit them to unilaterally advance a restructuring proposal to the final stage of the process. Thus, the *status quo* defines the competitive and other economic conditions that govern the industry's performance during the screening stage, where the actual decisions are made to forward proposals for further and more detailed consideration. As a result, the continuation of the *status quo* provides legislators and regulators with the time that they need to find a mutually acceptable alternative to the current industry structure without inhibiting or detracting from the current operation of the industry's markets. Hence, the *status quo* acts as a touchstone for the government's effort to restructure an industry because it continues to dominate the organization of the industry until legislators and regulators can demonstrate to their own satisfaction that they expect to experience a net gain when they restructure the industry.

The screening stage of the restructuring process is modeled as a two-person, noncooperative, normal-form game. The assumptions are:

- (1) No information-processing or computational limits.
- (2) No cooperation when calculating payoffs.

- (3) No contemporaneously or sequentially dependent payoffs.
- (4) No commitments to industry restructuring.
- (5) No complete payoff structure.
- (6) No inferences from past experience.
- (7) No internal proposals.

The first assumption ensures that the legislators and regulators are able to compute accurate estimates of the costs, values, and risks of the restructuring proposals, while the second assumption ensures that legislators and regulators calculate payoffs without the cooperation of the other. The third assumption ensures that neither legislators nor regulators can predict the behavior of the other. Additionally, they cannot maximize their payoffs in the screening stage by grouping proposals together or by evaluating them in a specific order. Thus, legislators and regulators lose nothing by considering each proposal one at a time and in no particular order.

The fourth assumption ensures that the model does not degenerate into the dominance of the *status quo*, wherein legislators or regulators guarantee that no change in industry structure ever occurs for any reason. The fifth assumption ensures that legislators and regulators do not know each other's equilibrium strategies because they are uncertain of the other's estimates of costs, values, and risks.<sup>15</sup> The sixth assumption ensures that legislators and regulators do not make choices on the basis of information that is associated with past efforts to restructure the electricity industry. The seventh assumption ensures that legislators and regulators are presented with externally generated restructuring proposals, which means that neither group is in the position to regard its restructuring proposals more highly than proposals submitted by others.

A 2 x 2 matrix is used to model the normal-form game for the screening stage of the restructuring process because there are only two strategies — accept or reject.

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<sup>15</sup> If the two players did have perfect knowledge of the payoff structures for all proposals feasible or otherwise, then the model would be a two-person, non-cooperative game with complete information. Hence, the game would have a mixed strategy Nash equilibrium. See, M.J. Osborne and A. Rubinstein, *A Course in Game Theory* (Cambridge, MA: The MIT Press, 1994).

Each element of this matrix denotes the legislators' and regulators' payoffs for the pairs of strategies. A geometric procedure has been devised to solve games of this type.<sup>16</sup> If the payoff structure is complete, common knowledge to legislators and regulators, and they select their strategies simultaneously<sup>17</sup>, then their choices are determined by considering all of the payoff information shown in the matrix and drawing arrows towards their strategies. To illustrate how this procedure works, consider Figure 1. If the column player, which is assumed to be the regulators, chooses to accept the proposal, the row player, which is assumed to be the legislators, prefers to accept the proposal because the payoff is larger than the payoff associated with rejecting the proposal; that is, 8 versus 6 for the legislators. The legislators also prefer to accept the proposal even if the regulators reject the proposal. Note that their payoff from acceptance in this instance is 7, whereas their payoff from rejection is 5. Thus, both (vertically drawn) arrows for the legislators point toward "accept." Next consider the regulators' choices. If the legislators accept the proposal, then the regulators prefer to accept the proposal because their payoff from acceptance is 6, while their payoff from rejection is 5. Even if the legislators reject the proposal, the regulators still prefer to accept the proposal because their payoff is 4 versus 3. Thus, both (horizontally drawn) arrows point toward "accept.". Hence, this game has a Nash equilibrium of {accept, accept} with a payoff of (8, 6).<sup>18</sup> This equilibrium also is the solution for this normal-form game.<sup>19</sup>

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<sup>16</sup> R. Gardner, *Games for Business and Economics* (New York: NY: John Wiley & Sons, Inc., 1995).

<sup>17</sup> Common knowledge means that the column player knows that the row player receives, say, eight units of utility, while the row player knows that the column player receives, say, six units of utility when they both decide to accept the proposal. Furthermore, these players know that the other players know these payoffs. Simultaneous does not really mean "at the same moment in time" when it is used to describe the process of the play of a noncooperative game. In this context, simultaneous means that each player is unaware of the other player's strategic choice at the time that they are making their strategic choice. Hence, the players can make their choices at different points in time as long as their choices are kept secret from the other players.

<sup>18</sup> A Nash equilibrium means that the players cannot do any better by changing their equilibrium strategies when they assume that the other players behave rationally. That is, they cannot benefit by defecting from the equilibrium strategy when it is common knowledge that their opponents will select their optimal strategies.

<sup>19</sup> This equilibrium is the solution for the game because it is the only equilibrium.

	Accept	Reject
Accept	(8, 6)	(7, 5)
Reject	(6, 4)	(5, 3)

The diagram includes arrows indicating best responses: a horizontal arrow above the table points from 'Reject' to 'Accept', and a horizontal arrow below the table points from 'Reject' to 'Accept'. A vertical arrow to the left of the table points from 'Reject' to 'Accept', and a vertical arrow to the right of the table points from 'Reject' to 'Accept'.

Fig. 1. Industry restructuring with one equilibrium.

Changes in the payoff structure often affect the game's equilibrium. Figure 2 differs from Figure 1 with respect to the regulators' payoffs. The legislators prefer to accept the proposal when the regulators choose to accept the proposal. However, they prefer to reject the proposal when the regulators reject the proposal. Similarly, the regulators prefer to accept the proposal when the legislators accept the proposal and to reject the proposal when the legislators reject the proposal. Hence, this game has two Nash equilibria – {accept, accept} and {reject, reject}.<sup>20</sup>

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<sup>20</sup> A game with multiple equilibria may not have a clear-cut solution. This game does not have a solution because the iterated elimination of strictly dominated strategies is unsuccessful, i.e., there are no dominant strategies in this normal-form game for either the legislators or regulators.

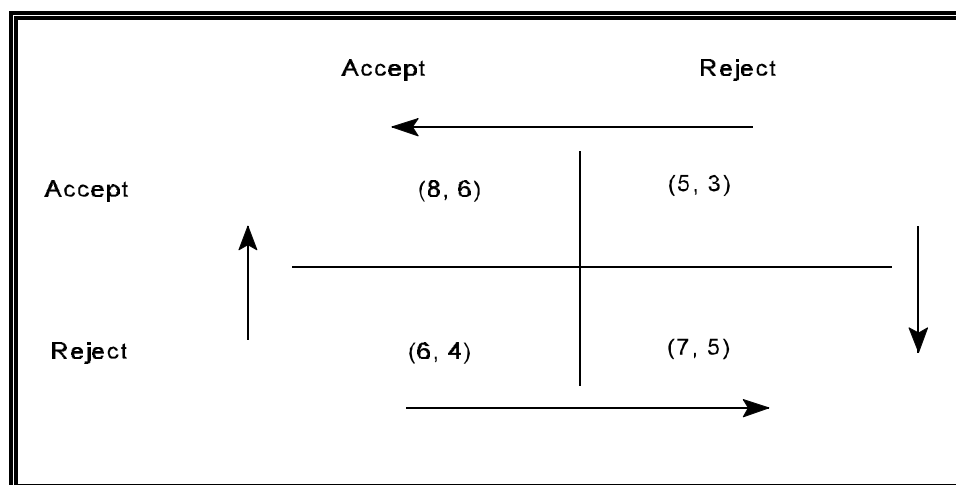


Fig. 2. Industry restructuring with two equilibria.

Figures 3 and 4 represent a normal-form game with an incomplete payoff structure. In this instance, legislators and regulators are faced with a restructuring proposal that contains positive, negative and zero payoffs. Figure 3 shows that legislators want to accept the proposal. A payoff of 3 is preferred to a payoff of - 4, a payoff of 0 is better than a payoff of - 1. Figure 4 shows that regulators always want to accept the proposal. Hence, legislators and regulators reach the Nash equilibrium of {accept, accept} with a payoff of (3, 3). The equilibrium also is the solution for this game. Thus, the assumption of an incomplete payoff structure does not alter the solution of a one-shot game when only the individual payoffs are the criteria for strategy choices.

The net-gain criterion eliminates prisoners' dilemmas from the class of feasible restructuring proposals.<sup>21</sup> A proposal of this type exists when the best that legislators

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<sup>21</sup> The "Prisoners' Dilemma" is a two-person, noncooperative game that models a situation where two players *cannot* achieve the best joint outcome by following their own self-interests. Instead, they receive the worst possible joint payoff by using the solution concept of undominated strategies. The story lying behind this game follows. Two individuals have been arrested for a crime that will result in one year in prison, if they are convicted. The police have amassed incontrovertible evidence of their guilt, thereby assuring the prosecutor of a conviction. The police also suspect that these two individuals committed a crime that carries a sentence of three to five years in prison, if convicted. However, the evidence is sufficiently weak that the prosecutor is not assured of a conviction without a confession by either or both of the suspects. Each suspect is presented with the following choice. You will go to prison for four years and your partner will go free if you remain silent and partner cooperates with the

or regulators can do is not to experience any economic loss as a result of its implementation. This potential is realized only when legislators or regulators can forward a proposal to the final stage over the objection of the other. But, such action is not permitted by the rules of the screening game. Therefore, prisoners' dilemmas are not an analytical issue.

	Accept	Reject
Accept	(3, ?)	(0, ?)
Reject	(-4, ?)	(-1, ?)

Fig. 3. Incomplete payoff structure for legislators.

	Accept	Reject
Accept	(?, 3)	(?, -4)
Reject	(?, 0)	(?, -1)

Fig. 4. Incomplete payoff structure for regulators.

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prosecution, or both of you will go to prison for a maximum of three years if you both cooperate. Each suspect's best individual strategy for this situation is to cooperate with the prosecution. Since each suspect is assumed to act individually, they both cooperate and go to prison for three years.

Legislators and regulators compute their payoffs for a restructuring proposal from their estimates of the proposal's costs, values and risks to them. The measure of a payoff is the present value of the net economic benefits that accrue to legislators or regulators when the proposal is actually selected for implementation. Payoffs so derived indicate what legislators and regulators consider to be in their best interests as far as restructuring proposals go. Meanwhile, unimpeded information processing and computation ensure the evaluation of *all* of the submitted industry restructuring proposals in this manner. After the evaluations are complete, legislators and/or regulators eliminate the rejected or blockaded proposals from further consideration.<sup>22</sup> Neither group questions the blockading or rejection of a restructuring proposal because each group knows that either action induces another proposal when the special interests still want to restructure the industry.

Obviously, there are no procedural or logical difficulties when legislators and regulators unanimously accept or unanimously reject a proposal. An accepted proposal is forwarded to the final stage, and a rejected proposal is discarded. If every submitted proposal is unanimously rejected, then the *status quo* remains in effect until other restructuring proposals are submitted for consideration.<sup>23</sup> Also, procedural difficulties do not arise when legislators and regulators have diametrically opposed positions on a restructuring proposal. If, say, legislators want to accept the proposal and regulators want to reject it, then the legislators work to keep the proposal on track. Meanwhile, the regulators work to derail it. This interaction leads to the inevitable derailment because the legislators are not allowed to impose their wills and wishes on the regulators.

## SOLUTIONS FOR THE SCREENING STAGE

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<sup>22</sup> When a proposal is blockaded by either legislators or regulators, the *status quo* remains in effect because the industry must continue to function and the group that supports the proposal lacks the power to override the wishes of the other group.

<sup>23</sup> Other proposals will surface within a short period of time as long as someone wants to restructure the industry.

As legislators and regulators search for a solution to the screening stage of the game, the regulators' veto power should cause them to be oblivious to the payoffs that may be received by the legislators. Additionally, their ability to veto a legislator-supported proposal should provide them with an incentive to behave as if their only concern should be to do the best that they can for themselves and their constituencies. Still, regulators have to acknowledge in the course of pursuing their self interests that they strategically interact with the legislators.

Since the rules of the game for the screening stage do not allow legislators or regulators to unilaterally forward a proposal to the final stage of the restructuring process, a unilateral rejection of a submitted proposal amounts to a veto. Hence, the payoffs for any cell of the game that contains "reject" as a strategy can be normalized to zero without loss of generality. Recall that the net-gain criterion eliminates all no-loss outcomes from further consideration after the screening stage of the process. While this normalization greatly simplifies the game's analysis, it also creates a game structure wherein the Nash equilibria in pure strategies are determined by the signs of the legislators' and regulators' payoffs when they accept a proposal for forwarding to the final stage. Figure 5 shows that the equilibrium/solution for this game is the outcome of {accept, accept} when these actions result in positive payoffs. Figure 6 shows the multiple equilibria when both payoffs associated with the acceptance of a proposal for forwarding to the final stage are negative.

Figures 7 and 8 show the Nash equilibria when either legislators or regulators receive a positive payoff as a result of forwarding the proposal, while the other receives a negative payoff. These equilibria indicate that "reject" is a weakly dominant strategy for the legislators or regulators faced with a net loss.

The set of Nash equilibria for the screening stage of the game reveals only one solution in pure strategies. It occurs when the payoffs for legislators *and* regulators are positive. Otherwise, there are multiple equilibria in pure strategies that include {reject, reject} and exclude {accept, accept}.<sup>24</sup> These equilibria are induced by the veto that

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<sup>24</sup> If our restructuring game included side payments, then the player that benefits from the proposal could offer to share some of its gains with the other player. However, the side payment would have to be a redistribution of gains that does not involve any changes to the restructuring proposal. To see why, note that a restructuring proposal is an explicit and readily observable list of acceptable and



has been granted to regulators. Furthermore, the equilibria are equivalent because a unilateral rejection of a proposal by either legislators or regulators has the same effect as the simultaneous rejection of the proposal by both of them.

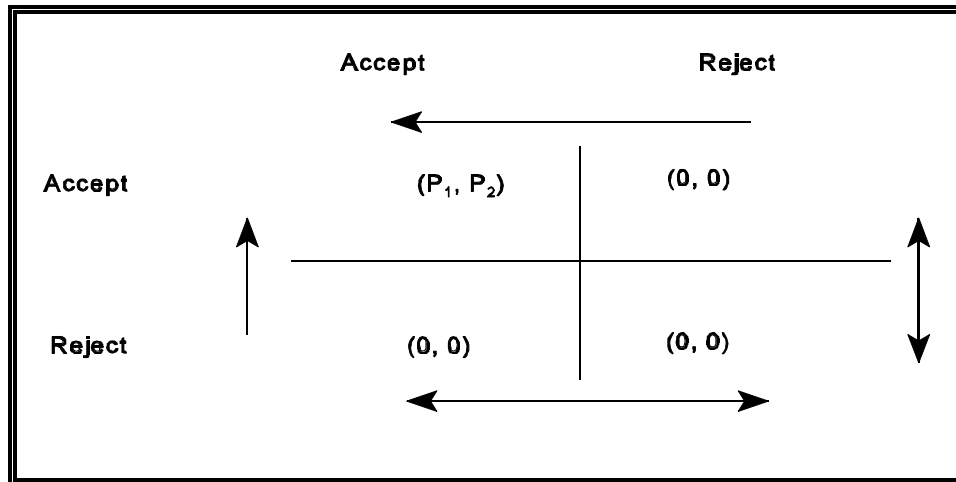


Fig. 5. Solution for positive payoffs.

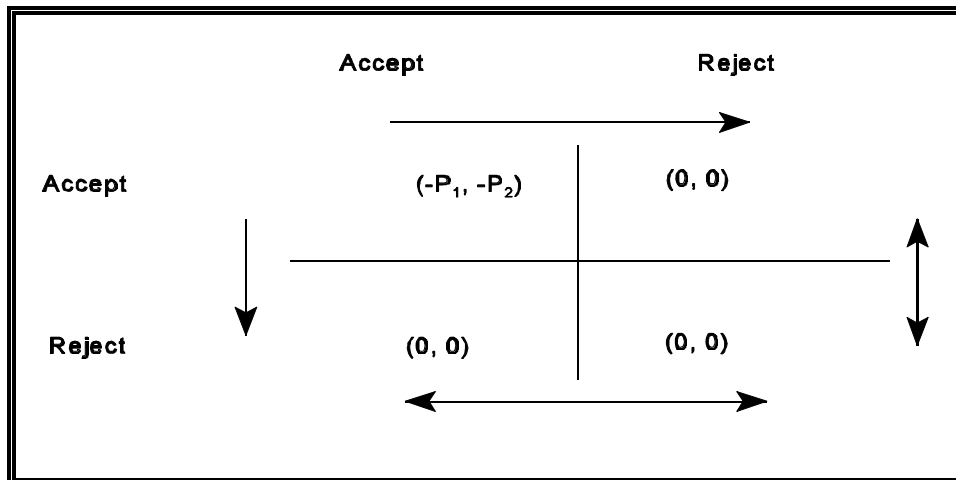


Fig. 6. Multiple equilibria for negative payoffs.

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unacceptable market institutions and practices. Changes to this list destroy the current proposal and create a new one.

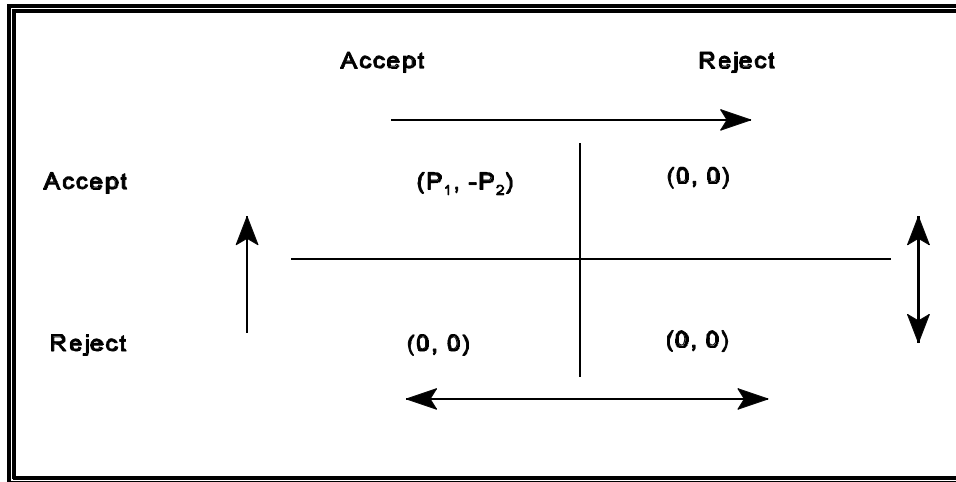


Fig. 7. Industry restructuring solution for  $P_1 > 0$  and  $-P_2 < 0$ .

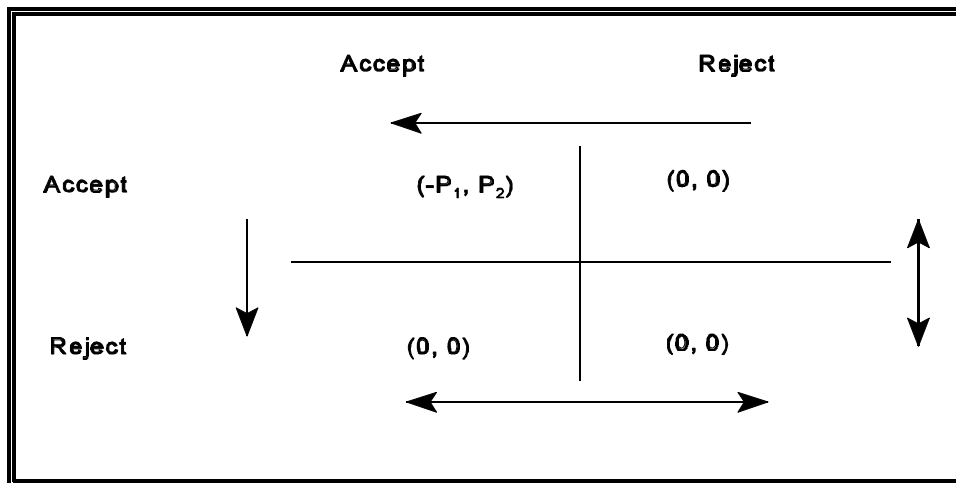


Fig. 8. Industry restructuring solution for  $-P_1 < 0$  and  $P_2 > 0$ .

Simultaneous acceptance is the solution in pure strategies for this game. It exists if legislators and regulators expect to earn positive payoffs when the submitted proposal actually is implemented. However, the solution is not guaranteed to emerge when the set of restructuring proposals is finite. Consider in this regard a single restructuring proposal with a negative payoff for legislators or regulators. By the rules of this game, it will be blockaded by legislators or vetoed by regulators. Next, add another proposal that also has a negative payoff for one of the players. There are now

two proposals in the set, and both will be blockaded or vetoed. Keep adding proposals to the set, and let each addition have a negative number in the payoff matrix. Then the entire set of submitted proposals will be blockaded or vetoed. Since this set is assumed to be finite, the activity of adding proposals eventually will be terminated. Thus, there is no guarantee that a finite set of restructuring proposals will contain a proposal that legislators *and* regulators find acceptable. Conversely, a solution may be observed more than once. In the case of multiple solutions, each one is forwarded to the final stage of the restructuring process.

The solution's characteristics for the screening stage of the game imply that restructuring occurs only when a proposal's benefits exceed its costs for legislators and regulators. The reason is that either group uses its veto or blockade power to continue the *status quo*, if a proposal's benefits are less than its costs. This aspect of the game indicates that it is less likely that industry restructuring will actually take place when costs are rising more quickly than benefits. Alternatively, restructuring is more likely when the converse is true. These possibilities also suggest the following activities in the initial stage of the game: legislators or regulators who tend to approve of a proposal should focus their efforts on deflating the its costs and inflating its benefits; meanwhile, those who tend to disapprove of the same proposal should target their efforts on increasing its costs and decreasing its benefits.

## CONCLUSIONS

A submitted proposal reaches the final stage of the restructuring process only when payoffs are positive, which means that its benefits exceed its costs. Clearly then, the forwarding of a proposal for further consideration becomes more probable when the submitter reduces the proposal's costs and increases its benefits for legislators and regulators.

Unilateral rejection of a proposal is a powerful policy tool when the *status quo* is the default position. This use of the existing industry structure lies at the center of this analysis. It permits the creation of an equivalence relation that reconciles the consistent Nash equilibrium of {reject, reject} and the inconsistent Nash equilibria of

{reject, accept} and {accept, reject}. Finally, the persistence of the *status quo* ensures that the operations of existing markets are not disrupted when legislators and regulators are unable to agree on which restructuring proposals to forward to the final stage of the process.