Institutions, Exchange Relations, and the Emergence of New Fields: Regulatory Policies and Independent Power Production in America, 1978–1992

Michael V. Russo
University of Oregon

This paper analyzes how a new field, independent (or non-utility) power production, was created by a federal mandate that electric utilities purchase power from private generating sources and how the field was populated. Results show that key rules that state regulatory bodies adopted or rejected regulating exchange between independent power producers and utilities were influential predictors of organizational foundings. Results also show that collective action by independent power producers boosted foundings. Finally, if the preexisting relationship between utilities and regulators was one of accommodation, foundings were suppressed. The paper examines these results in view of economic and sociological perspectives on public policies, spotlighting the vital role of institutions in early population dynamics.•

Like geophysical events, institutional forces continually shift the organizational landscape. Public policies, one class of such forces, influence existing organizations and fields routinely and sometimes profoundly. Policy initiatives can usher organizations into previously foreclosed domains, as seen by the post-deregulation diversification of savings and loans (Haveman, 1993), or restrict existing organizations from entering sectors closely associated with their own, as Microsoft may find when its antitrust case ultimately concludes. But public policies also create opportunities at the fringes of existing fields, attracting organizations armed with a variety of technologies and strategies. For example, deregulation gave rise to organizations as diverse as discount brokerages, all-first-class airlines, and waste-to-energy facilities. We know much less about the effects of public policies on the birth of organizations in new fields, however, than we do about their effects on existing organizations and fields.

Organization theorists studying how institutions shape competitive interactions have now produced research substantive enough to be categorized into three broad themes that bear on the issues of policies' effects on foundings. The first theme pinpoints the most salient facilitating role for governmental actors, channeling resources directly to organizations through policy making. Tucker, Singh, and Meinhard (1990) demonstrated that periods of direct government subsidies and explicit fiscal restraints inflated and deflated founding rates of voluntary social service organizations, respectively. Corroborating evidence was provided by Staber (1989) and Swaminathan (1995), who found that favorable tax policies stimulated foundings of cooperative organizations and wineries, respectively. Dobbin and Dowd (1997) showed that public capitalization increased the founding rate of early railroads in Massachusetts. If this were the extent of theoretical interest in public policy and organizational foundings, such results would not only reflect intuition but, more importantly, portray public policy as an influence analogous to a number of other resource-related changes that can influence foundings. But two other themes apparent in the literature describe how public policies operate in ways that are more subtle and potentially more comprehensive than simply shifting the incentives facing entrepreneurs.

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The second theme connecting institutions and organizational foundings spotlights the role of ties between organizations and key institutions. Extending the work of Singh, Tucker, and House (1986), Baum and Oliver (1992) examined how the extent of linkages between a population of day care centers and its institutional environment influenced foundings. They found support for the concept that increases in such embeddedness (Granovetter, 1985) augmented foundings early in the population's history. Such ties enhance prospects for resource acquisition by establishing the legitimacy of new fields of endeavors (Galaskiewicz, 1985).

The third broad theme in this literature focuses on how institutional actors influence the relationships between like organizations in new and established fields. Competition is attenuated when institutional policy constrains where and how similar organizations can compete. Carroll and Wade (1991) and Lomi (1995) explored differences across regional jurisdictions, showing how founding rates of organizations in the brewing and cooperative banking sectors varied with their institutional contexts. But institutional changes in policy also can spill over these boundaries. In a study of how contrasting regulations influenced American brewers, Wade, Swaminathan, and Saxon (1998) established that regulations can affect not only foundings of organizations to which they apply closely, but also foundings of organizations that experienced their effects only indirectly. Foundings can also be shaped by competition policies that influence interrelationships among incumbents that do compete directly. Dobbin and Dowd (1997), in their analysis of public policy and the foundings of early railroads in Massachusetts, found that pro-cartel policies weakened inter-railroad competition, increasing foundings, and that antitrust policies strengthened competition, decreasing foundings. These results validated the arguments of Lindberg, Campbell, and Hollingsworth (1991), Roy (1997), and others that the level of competition itself can be a derivative of public policies, with important ramifications for foundings.

Although scholars have turned their attention to how public policies influence foundings, the action has been at a decidedly macroanalytical level. The result is that the more microanalytical elements of exchange—terms of exchange, relationship building, and relationship maintenance between new entrants, incumbents, and institutional actors themselves—have received little scrutiny. Adopting this microanalytical focus would permit an analysis of how institutions promote foundings by reducing the transaction costs of exchange between new entrants and incumbent organizations in a field. It would also permit an analysis of how new entrants themselves can energize institutional change that influences foundings (Ingram and Inman, 1996), as well as how preexisting relationships influence foundings. I adopt such a focus in this study to explain foundings in a new field, independent power production in the United States. Analyzing the rise of independent—or non-utility—power producers in the United States is well suited to my goals, because this growth occurred against a backdrop of great variation in institutional environments, as measured by different policies adopted by regulators across the states to deal with independent power producers. I begin with a brief history to provide the context.

THE RISE OF INDEPENDENT POWER PRODUCTION

From the early days of the twentieth century, electric utilities were generally regulated on a state-by-state basis by public utility commissions. The utility was given monopoly status, in return for releasing control of electric rates and a number of other parameters to its regulatory commission. Preferring acquiescence to conflict, these agencies enjoyed a quiet coevolution with utilities during a period of falling prices that spanned the middle decades of the century (Shepherd, 1985). But a rude awakening came when the 1973 OPEC oil embargo cast worldwide fossil fuel markets into turmoil and quickly inflated energy prices. This dramatic reversal of fortune upset the balance of interests that had long kept public utility regulation an obscure and languid task (Joskow, 1974).

Public relations worsened almost as rapidly as regulatory relations in the post-embargo environment, and Americans began to challenge the role of electric utilities in society (Anderson, 1981). At the state level, the traditional procedural model used to address regulatory issues became highly legalistic as pressure groups began intervening in rate hearings (Gumpert, 1978; Gormley, 1983). The industry generally did not benefit from close observation, and several well-publicized cases pushed an ill-prepared industry into the spotlight. In one, New York's Consolidated Edison used threats and heavy-handed methods to try to block residents in a New York City tenement from constructing an electricity-generating wind turbine on the roof of their tenement after it had shut off their service for non-payment (Energy Task Force, 1977). In other instances, large industrial customers were told that if they produced any electricity on site for their own use, the utility would make no further electricity available to them. Legal challenges followed. By the mid-1970s, the traditional model of a monopoly subject to public-utility-style regulation had broken down (Gumpert, 1978).

Calls for government action persisted. In 1977, President Carter announced that he was submitting to Congress a comprehensive energy plan based on the four strategies of conservation, production and rational pricing, conversion away from imported oil, and development of new energy sources, including solar energy (*Public Utilities Fortnightly,* 1977). Congressional debate on the plan focused on natural gas deregulation, but a number of the omnibus bill's other provisions addressed utility issues, including mandates for state regulators to abolish rates wherein electricity became cheaper the more it was consumed, to consider moving to time-of-use pricing, and to force utilities to interconnect and purchase power from any small-party generating power. This national plan, one of the most comprehensive pieces of postwar legislation to be considered by Congress, was the subject of fractious debate, and utilities lobbied fiercely against almost all change. But public sentiment was on the side of reform (Farhar, 1994).

The final bill passed after eighteen months and embodied considerably less change than its initial form (Corrigan and

Kirchen, 1978), but one of its laws, the Public Utilities Regulatory Policies Act of 1978, or PURPA, contained the legislative seeds that were to launch the independent power production industry in the United States. One of its many statutes forced utilities to accept and to pay for power from private electricity producers. The law was intended to assist industrial plants and fuel extraction facilities that could produce electricity as a byproduct of their ongoing manufacturing processes. These so-called cogenerators formed one major category of power producers small enough to be "qualifying facilities" (QFs) under PURPA. But the law generated an entrepreneurial opportunity that was not envisioned by its authors: building new facilities for the sole purpose of producing electricity for sale to utilities (Joskow, 1988; Serchuk, 1995). This opportunity was not lost on alternative energy technology proponents, who sought qualifying facility status in increasing numbers. Separately, and not intended to act in concert with PURPA, federal tax credits were made available to alternative energy projects by Congress (Cox, Blumstein, and Gilbert, 1991; Serchuk, 1995).

The Federal Energy Regulatory Commission (FERC) delegated to state public utility regulatory commissions the task of determining the price that would be paid to qualifying facilities for power. Under the FERC directive, this price was to be based on the cost that the utility avoided by purchasing QF power, in theory reflecting its marginal cost. So-called "avoided costs" tracked fossil fuel costs, which varied across states. Due to the accounting vagaries of regulated firms, however, setting actual avoided costs required both interpretation and judgment. This gave great latitude to state commissions as they fashioned policies for QF power. Furthermore, aside from pricing, other pivotal differences across state regulatory commissions evolved as they addressed additional contractual issues at the interface of QFs and utilities.

A significant change in the economic environment for qualifying facilities occurred in 1986. At year-end 1985, federal tax credits for alternative energy projects expired. Early in 1986, oil prices collapsed, depressing avoided costs and, hence, project economics. Congress also held hearings on whether or not to amend PURPA. Arguing for the removal of the key advantage of qualifying facility status, Idaho Senator James A. McClure cited the high cost of PURPA power and the lack of need for additional resources under slack demand conditions (United States Senate, 1986: 2). Louisiana Senator Bennett Johnson added that since many QFs were oil- and gas-based cogenerators, PURPA had acted to increase, not decrease reliance on fossil fuels (United States Senate, 1986: 5). Opponents of revision, such as Duncan Wyse of the California Public Utilities Commission, cited the need to protect small power sources, the conceptual propriety of avoided-cost pricing, and the flexibility that numerous small projects offered to utility planners (United States Senate, 1986: 575). Unlike the debate eight years earlier, seven independent power industry associations were represented at congressional hearings, bolstered by several pro-QF environmental groups (United States Senate, 1986).

PURPA emerged largely unchanged, and the issue was again revisited when Congress debated the bill that was to become the Comprehensive National Energy Policy Act of 1992. By then, however, independent power producers enjoyed such favor that according to Louisiana Senator Johnson, "a religious affiliation with QFs" existed in the Congress (Burkhart, 1992: 72). Partly, this was due to QFs collectively being cast as David to the utility industry's Goliath, but less heroic motives also may have existed. Policy makers saw QFs as essential to the transition to a deregulated future in which electric utilities would be separated along vertical lines, not unlike the natural gas industry, where sellers of gas are only incidentally producers of gas (Pierce, 1991). But QFs clearly were a vital force in policy affairs by this point and used the public policy process to further their own interests in a manner typical of more mature industry sectors. This embeddedness proved beneficial: instead of removing the mandate that utilities purchase power, against the protestations of the utility industry the final bill provided for a per-kilowatt-hour subsidy for renewable energy QFs, beginning in 1993. A quid pro quo was extended to utilities, however, as barriers to their own investment in small-scale technologies were removed. Thus, the qualifying facilities development created by PURPA established itself across the United States. Figures 1 and 2 trace organizational foundings of alternative energy technology and cogeneration projects from 1978 through 1992. The profiles of the two subpopulations are quite similar, which suggests that some common forces may have been operating on both. The peak and subsequent decline in foundings may be the result of fossil fuel costs, which shot up before subsequently collapsing in early 1986, when federal tax credits extended to alternative energy technologies had also just expired.

One important characteristic of the independent power industry that is evident from its history is the importance of explicit and implicit exchange, indicating that institutional economics

Figure 1. Qualifying facility foundings, alternative energy technologies.

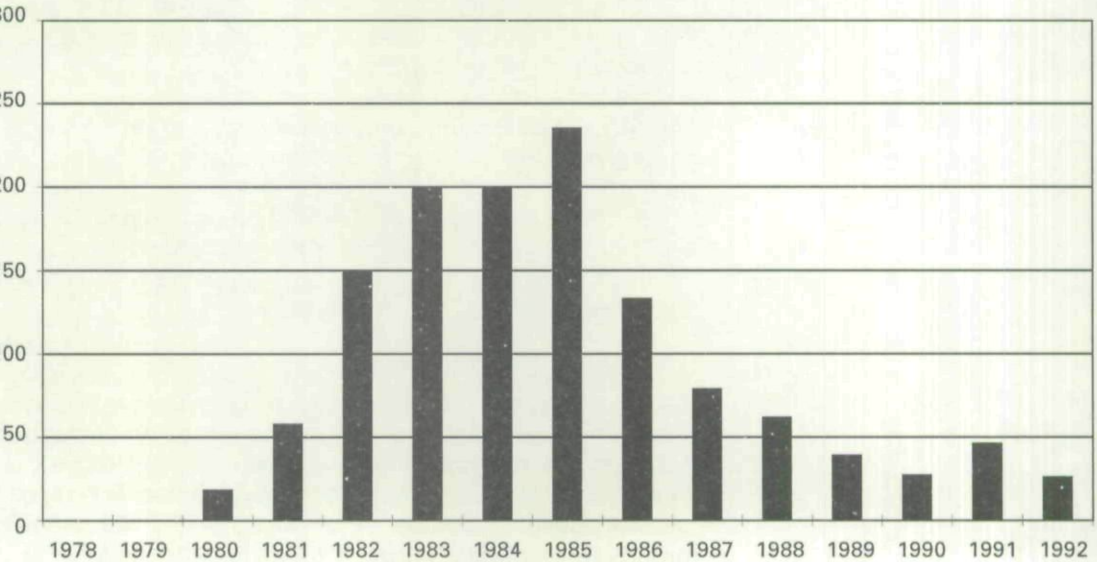
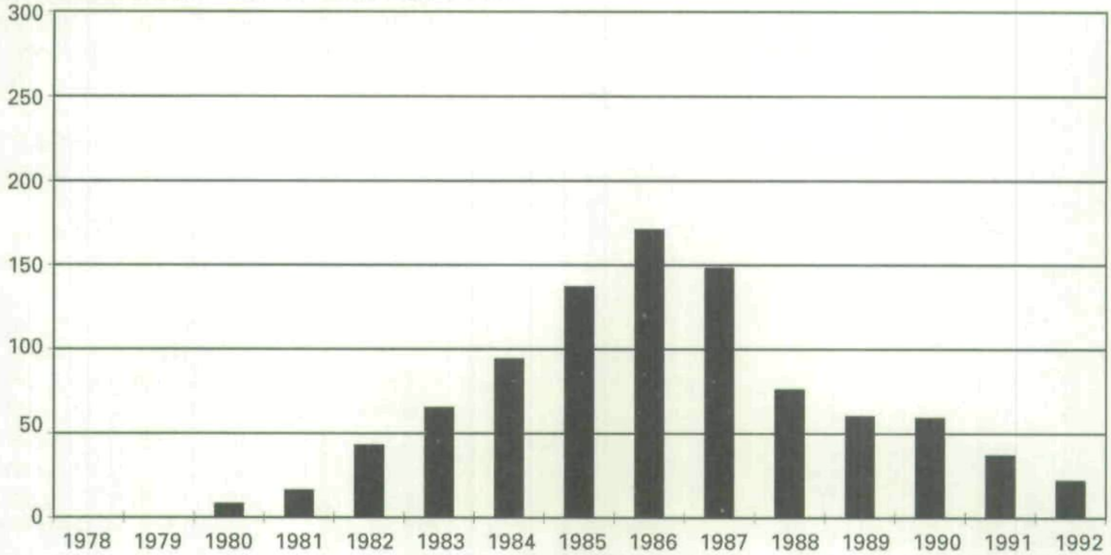


Figure 2. Qualifying facility foundings, cogeneration.



plays a critical role in early organizational dynamics. A passage from an address made by wind energy developers in 1983 illustrates how important this sense of exchange was to the industry:

> . . . there is an implicit compact between utilities and regulatory agencies to allow them to sell power at cost plus a reasonable rate of return. . . . A regulatory commission could not simply declare that a utility's power could not be sold at all or had to be sold below cost. . . . A similar compact between small power producers and regulatory agencies is needed to allow small power producers to sell power. The bargain is different: small power producers receive an avoided-cost based price and in exchange assume technical risks borne by ratepayers and (to a lesser extent) stockholders under traditional regulation, but the concept is the same. (Floyd and Marcus, 1983: 11)

The notion of an implicit contract that is articulated by these developers dovetails with the ideas of institutional economists (e.g., MacNeil, 1975; Goldberg, 1976), who developed the model of relational contracting and applied it to regulation. In this view, regulated firms and regulators must remain independent, while at the same time yoked in a long-term exchange relationship. In public utility regulation, in essence the utility is guaranteed reasonable profits in return for permitting regulators to make decisions on prices it can charge customers and many investments that it can make. Under such a system, adaptation to changing circumstances is easier than if the utility and its regulator enjoyed more autonomy (Williamson, 1985). The exchange relationships in such a system are determined by institutions.

The Role of Institutions

As used herein, the term institution connotes explicit social rules. Thus, public policies, laws, and ethical standards represent institutions; more cognitive processes that result in legitimacy and taken-for-granted status do not. This represents a subset of the institutions Scott (1995: 33) defined more broadly as "cognitive, normative, and regulative structures and activities that provide stability and meaning to social activities." Essentially, my definition contains elements of the regulative and normative pillars of institutions identified by Scott, but not the cognitive pillar. Thus, it is close to North's (1996: 344) definition of institutions as "formal constraints (rules, laws, constitutions), informal constraints (norms of behavior, conventions, and self-imposed codes of conduct), and their enforcement characteristics." In Scott's schema, regulative institutions are more fundamentally economic in character, while normative institutions are more fundamentally social. But both elements guide behavior by delineating acceptable behavior, as well as consequences for non-compliance. One important way that institutions guide behavior in new fields is by mediating, or conditioning, relationships between new entrants to that field and incumbent organizations with which they must exchange resources.

Governing exchange. Relationships between an organization in a new field and those other organizations with which it exchanges resources involve some transfer of valuable goods, services, currency, or other support and depend critically on repeated social and economic interactions (Carroll, Delacroix, and Goodstein, 1988; Leblebici et al., 1991). When those organizations wield much greater power than new, smaller organizations, commercial interaction can produce thorny problems (Pfeffer and Salancik, 1978; North, 1996), including the potential for the larger organization to refuse to deal with the smaller one, to push shared costs onto it, to block legal avenues for redress, and to otherwise use its muscle to gain at its partner's expense. These contingencies can be viewed as classic transaction costs (Williamson, 1985), since each has more to do with the nature and governance of exchange than products or services themselves.

In this and other situations in which transaction costs are high, the arguments of institutional economists like Coase, North, and Williamson can help us understand how institutions can reduce the entry barriers that transaction costs erect. In many contexts of exchange, such as most spot markets, transaction costs are minimal, and the institutional actor's role may be limited to specifying property rights (Coase, 1960). In a significant number of other contexts, including situations in which one or more of the parties must commit specific assets to an ongoing relationship, transaction costs can be high and even prohibitive. For North (1990: 12), the insight is simple and compelling: "when it is costly to transact, institutions matter." Introducing new mandates and rules for exchange is one effective way that institutions of the state can overcome transaction costs and redress severe transactional hazards. Thus, having an institutional framework in place that reduces the transaction costs facing potential entrants into a new field will raise the rate of founding of new organizations, other things being equal.

When new organizations must depend on other organizations for resources, asymmetries in power can discourage entry and intensify the risks faced by new entrants. One way to overcome such a problem is by mandating exchange between organizations. This approach has a long history in regulated industries, as when railroads, under common carriage rules, were required to offer transportation to any customer on a non-discriminatory basis (Shepherd, 1985). Often, such a directive is not enough, however, and the terms of exchange themselves will need to be addressed. This can occur when the product to be sold is idiosyncratic (Monteverde and Teece, 1982) or requires the seller to dedicate assets that expose that organization to contracting hazards (Joskow, 1985). But, frequently, pricing itself will be at issue, with no acceptable private method for the parties to protect themselves against opportunistic attempts to change pricing criteria. Under these conditions, if the institutional agent adopts a formal definition of the price that is to be paid to a potential producer firm and mandates its use in exchange, transaction costs will decrease and organizational foundings will increase. In the independent power production industry, the pricing issue was how to define avoided costs.

Formally defined avoided costs. Under PURPA, states were expected to develop methods for defining avoided costs. If a commission failed to do so, it guaranteed that qualifying facilities would face a precarious contractual contingency, because the basis for these costs was so unclear. Utility accounting is notoriously arcane (Brock, 1981) and based on aggregate, not marginal, costs. Given these conditions, the utility and the QF would need to agree on how avoided costs would be determined. This would assuredly give the utility an upper hand—and inject contractual stress into exchange relations. For example, without a precise method for calculating avoided costs, a utility whose marginal cost was based on an oil-fired power plant, operated to meet the final kilowatt-hours of demand by electricity customers, could claim a wide range of marginal costs, based on which supplier provided fuel for the plant. It could also exaggerate the number of hours that it bought discounted energy and limited the oil-fired plant's operation. Long-term supply costs, generally cheaper than spot prices, might be proposed. Even if spot prices were specified as the marginal cost, would this marginal cost be used for all hours during a given time period or simply during a few peak hours? What would happen if spot prices dropped below long-term prices? Regardless of how careful the parties to the contract are about specifying avoided costs, there are simply far too many vagaries that can be exploited by the utility after the QF has irreversibly committed to constructing a generating facility. Any disputes that emerged after the QF project began generating power would surely advantage the utility, as the QF would have no other buyer for its power.[1]

While it is impossible to write a contract that can specify all alternative states, some regulatory commissions developed a formal, standardized definition of avoided costs as one method to provide critical assurances to QFs; others did not. For example, the Arkansas Public Service Commission, which never formally defined avoided costs, decided to replicate and adopt the vague language that appeared in a federal statute (Arkansas Public Service Commission, 1983: 378): "[Avoided] energy costs are the variable costs associated with the production of electrical energy. They represent the

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During the study period, utilities were not required to transmit power generated within their systems to other systems.

cost of fuel, and some operating and maintenance expenses." The Arkansas commission went on to state that it expected that the complexity of the situation would require case-by-case negotiation of the price paid to QFs in many situations, opening a loophole for utilities and increasing transaction costs by introducing further doubt into the process of establishing payments to QFs. Under this regime, the determination of avoided costs and, to some extent, the need to subject a contract to specific negotiations are largely decisions made by utilities. Thus, risk was implicitly shifted onto the shoulders of QFs. By contrast, the formal definition of avoided costs established by the Florida Public Service Commission (1982: 286) was much more precise and explicitly addressed "economy energy sales," which represent discounted interutility sales:

> . . . we define avoided energy costs as the selling utility's real time incremental energy cost for the hour, before any economy energy sales are made, and the buying utility's real time incremental energy costs for the hour, after any economy purchases are made. For any hour in which a utility neither sells or buys economy energy, avoided energy costs are the utility's real time incremental energy cost of generation for that hour.

In contrast to the Arkansas commission, the Florida commission then went on to provide numerical examples of how its avoided cost definition would operate in practice, even including graphical representations in its decision. Under this regime, much clearer guidelines for avoided costs constrain the interpretational latitude of utilities and reduce the risk facing prospective QFs. Thus, there are strong reasons to believe that the transaction costs inherent in QF contracts would decrease significantly if the regulatory commission adopted a formal definition of avoided costs, leading to the first hypothesis:

H1: Founding rates of QF projects will be higher in states where regulators have defined how avoided costs would be determined.

Standard contracts. Institutional actors can also standardize not just the terms of exchange but the relationship itself. Even if forced to interact with new organizations and to exchange resources at externally imposed prices, existing organizations that feel threatened by newcomers may try to impose onerous conditions on them. In such a situation, organizational economics (Williamson, 1985) suggests that exchange partners also may behave opportunistically. Standardized contracts can reduce these and other uncertainties facing potential entrants in several ways. They undoubtedly raise the costs facing a larger organization that is contemplating acting opportunistically toward new organizations, because an opportunistic action in one case is an affront to the entire group of organizations whose contracts have similar language. Thus, the potential for picking off small organizations one by one is diminished.

Further, by mandating the use of contractual language that is clear and explicit, institutional actors can prevent a strong partner from forcing an unfair share of costs and risks onto a weaker partner. For example, of prime concern are the contractual methods by which a party to the contract can walk away from the agreement or drastically alter its relationship with another party. Risk of exit by "contrived cancellation" or other fundamental changes is significant when a contract is imprecise (Clarkson, Miller, and Muris, 1978, cited in Williamson, 1985). In the independent power production industry an example of how institutional actions can reduce the transaction costs of exchange comes from California where, early in the study period, Southern California Edison and San Diego Gas and Electric Company inserted the following clause in contracts they proposed to qualifying facilities (California Public Utilities Commission, 1983: 39):

> This Contract shall at all times be subject to such changes as any regulatory agency may direct in the exercise of its jurisdiction. If there is any conflict between the provisions of this Contract and agency, the Parties shall amend this Contract in a manner consistent with such regulatory changes.

Essentially, this clause would allow future regulatory commissions to overhaul in-force contracts, imposing significant regulatory risk on QFs. The California Public Utilities Commission (1983), in the course of developing and approving standard contracts for power purchase, rejected this wording. This event was welcomed by QF developers, as the old language tempted utilities to act opportunistically and "severely limit[ed] the ability of qualifying facilities to obtain financing for their projects" (Floyd and Marcus, 1983: 10).

Regulatory commissions also can use standardized language to reduce transaction costs that may arise from governing other contractual elements. An early Pacific Gas and Electric contract (Pacific Gas and Electric Company, 1981: A-12) contains this language on "force majeure," a term that includes acts of God and other unforseeable events: "The term 'force majeure' as used herein, means unforseeable causes beyond the reasonable control of and without the fault or negligence of the Party claiming force majeure." Such loose language is hazardous, as many events arguably could be placed in the force majeure category, allowing either party to evade contractual obligations. Again, since the QF depends more on the utility than vice versa, the clause would erode the QF's bargaining position should the parties use the contract to guide changes in their relationship. A subsequent commission-approved standard contract replaced this language with the following:

> The term force majeure as used herein means unforseeable causes, other than forced outages, beyond the reasonable control of and without the fault or negligence of the Party claiming force majeure, including, but not limited to acts of God, labor disputes, sudden actions of the elements, and actions by federal, state, municipal, or any other government agency. (Pacific Gas and Electric Company, 1983: A-6)

This language, while still broad, spells out several events that would fall into the force majeure category and includes a specific exclusion. Thus, with tighter contractual language, the risks facing the QF are more clearly delineated. So, in what they include and in what they omit, standardized contracts can reduce the transaction costs facing prospective QFs. Hence,

H2: Founding rates of QF projects will be higher in states where regulators have approved standard contracts for power purchase by utilities from QFs.

Collective action. The rise of organizations in any field is also influenced by their ability to exploit links to institutions (Aldrich and Fiol, 1994). The causal mechanisms to exploit such connections are likely to be fundamentally distinct for entrants to the new field and for the larger incumbent organizations, because the entrants must initiate and pursue relationships with key institutions from scratch, while the incumbent organizations benefit (or suffer) from preexisting relations with the institution in question. For organizations in a new field, collective development of strong ties to the institutional framework is critical to furthering the interests of its member organizations (Yoffie, 1988; Suchman, 1995a). Supportive actions by policy-making organizations to which a new organization is linked can serve not only to improve economic conditions for the organization but also to bolster its standing as a reliable and desirable exchange partner (Scott, 1987; Oliver, 1988). The federal government's decision to purchase enormous quantities of recycled paper was instrumental in broadening demand for recycled paper but also in reducing the risks perceived by others in following suit. Organizations within a new field are challenged in attaining a level of stature in this respect and may face a particularly skeptical policy-making environment if a key institutional actor is enmeshed with other actors who stand to lose as these organizations secure legitimacy and, hence, compete more effectively for resources. For example, the Federal Communications Commission's close ties to AT&T frustrated the efforts of long-distance upstarts like MCI to establish themselves via regulatory avenues (Derthick and Quirk, 1985).

One way to overcome institutional barriers to participation in policy development is to create interorganizational ties to policy-making units (Aldrich and Fiol, 1994). Such connections can disseminate information among members (Pfeffer and Salancik, 1978: 145) and forge social linkages between organizations and powerful institutional players (Oliver, 1991; Aldrich and Wiedenmayer, 1993). The ultimate goal of collective action is to vest the organizations' interests within the public policy domain. Vesting "means that the interests of a group are routinely taken into account by public authorities in the handling of state affairs" (Roy, 1981: 1289). Once legitimized, collective action can promote the field's aims because institutional actors must then recognize and respond to the status of its members. Ongoing dialogue and interaction then vests the interests of those in the new field, and the institution's ends and means will confer advantage on entrants. Thus, legitimacy is not sought for its own sake, but to ensure that interactions with an institution serve the needs of those in a new field. The presence of an organ for collective action is a good indication that the interests of the nascent industry are taken into account when institutional change occurs. In the post-PURPA world, collective action was taken by organized statewide QF lobbying groups, which represented QFs from both the alternative energy and cogeneration categories.

Statewide industry associations for QFs. While lobbying takes place in a great many contexts, state public utility regulation is marked by very strong rights to participation by third parties in rate hearings and elsewhere, and such "intervenors" can drive rate decisions (Joskow, 1974). QF intervenors routinely participated in debates on many aspects of the electric utility industry, not limiting themselves to very direct, specific arguments on resource-related issues. For example, in many states, industry associations were central participants in the debate over the need for electrical generating capacity. They were able to obtain access to utilities' methodology for power demand projections and make pointed criticisms to regulators, arguing that further QF development was in the state's long-run interest. The tight integration of intervenors and the process of regulation is illustrated in this passage written by the director of California's Independent Energy Producer Association:

> A possibly unexpected but beneficial effect of PURPA implementation is on the quality of regulation. Because the assumptions used in the calculation of avoided costs are so intertwined in the whole regulatory process, intervenors become involved in all electric utility regulatory proceedings, checking facts and figures, investigating computer models, and questioning inconsistent utility findings in various cases. Regulators have, in effect, acquired ancillary staff help. More experts are involved in all aspects of the regulatory environment. As a result of this more thorough examination of the facts, there is a better quality of regulation (Hamrin, 1987: 384).

In California and elsewhere, QF industry associations worked to create the type of institutional presence that could increase the flow of resources to QFs. But the flow took place less through directly seeking resources than through constructing an institutional framework in which QF interests were vested. In this way, the establishment and legitimation of links to regulators and behavior in these relations are a signal to potential entrants that an accommodating institutional environment awaits them. Thus:

H3: The presence of a statewide QF industry association will increase the rate of QF foundings.

Preexisting relationships. In new fields, an industry association can fashion an institutional environment that serves the interests of its members, but that institutional environment is also a result of preexisting ties between incumbent organizations in that environment (Astley, 1985). According to the institutional economics literature, regulation is an implicit contract (Williamson, 1985), and regulated firms and regulators are joined in a long-term relationship, wherein the regulated firm is kept financially viable in return for granting its regulator sovereignty over most pricing and investment determinations. This intertwining of decision making creates a close relationship, so close that one observer stated that "when you buy the securities of a utility, you are buying the public utility commission" (*Business Week,* 1979: 112). In addition, there is a social element to this relationship, illustrated by mechanisms such as the "revolving door," where individuals pass between public and private organizations in a sector (Eckert, 1981). Thus, the preexisting relationships between institutional actors and incumbent organizations are likely to have important ramifications for entry by new organizations.

Any long-term relationship has its ups and downs, and those between institutional actors and organizations with which they interact are no different. As years and decades pass, parties view each other through a lens whose acuity is sharpened by experience and retrospect. In this way, the nature of the relationship is established and stabilized (Granovetter, 1985). Norms concerning the appropriate forms of interactions and behavior materialize. But variation in such relations occurs across different institutional environments, because each environment displays unique characteristics (Russo, 1992). At one extreme, the relationship can be collegial, with the institutional actor and the organization that it oversees enjoying a degree of mutual trust and participating as equal partners in a decision-making process that is prompt and ultimately favors the overseen organization. At the other extreme, when regulators take their responsibility to be skeptical most seriously, distance and wariness characterize relations, and decision making is far less beneficial for the overseen organization. Over time, these interactions create a set of values that envelop and define the relationship. These institutionalized values (Scott, 1995) are as important to understanding conduct in the institution-organization domain as are the objective procedures, timetables, and statutes of the policy apparatus. In fact, it is easy to envision two institutional contexts with identical rules and statutes that witness completely different behavior and outcomes.

Those wishing to enter new fields, and who will depend on exchange with incumbent organizations, will find that their reception depends on the preexisting institutional environment and the extent to which the interests of incumbents are vested. Where relationships between incumbents and institutional actors are cozy and incumbents are well vested, they will encounter resistance. This resistance may stem from incumbents portraying new entrants as a destructive or destabilizing element in the sector, as when new airlines were rebuffed after first approaching the Civil Aeronautics Board to apply for interstate routes (Derthick and Quirk, 1985). Given that positive relations involve a high degree of trust, credibility is attached to such portrayals. In contrast, when relations in the institutional environment are poor, interests of incumbents lack deep vesting, and institutional actors are unlikely to see entrants as a threat. They may even see newcomers as valuable in balancing or otherwise offsetting the power of incumbents and enlist their support by facilitating entry. In the independent power production industry, the regulatory climate varied from state to state, as did its effects on entrants.

Statewide regulatory climate. As the independent power production field emerged around 1980, electric utilities operated in a myriad of different regulatory climates. In some states, such as Indiana, utilities had rate cases resolved quickly and with minimal review. In others, such as Alabama, regulatory activism was more often the case. In both cases, the regime in place was the result of years of interaction, but in all states, the debate over PURPA represented one more episode in a relationship already endowed with a long history.

State commissions, under a federal mandate to implement PURPA, received a stream of messages from utilities opposing QF projects. For example, many utilities argued that QF power was too expensive (Arkansas Public Service Commission, 1983) or would lead to operating problems for their systems (Wyoming Public Service Commission, 1983). Commissions responded differentially to this rhetoric, in ways that reflected the general regulatory climate. In Idaho, for example, this debate underscored the strident nature of its regulatory relations. With respect to hearings over rules for implementing PURPA, the Idaho commission's exasperation in dealing with its utilities was palpable: "It was a source of great concern to the commission that the utilities' reaction to each of these proposals was one of invariable hostility" (Idaho Public Utilities Commission, 1981: 381). Idaho Power Company took one of the strongest stands against the independent power production movement, its chief executive officer fuming that QF projects were "gold-rush enterprises flooding utilities with unneeded power at inflated rates." In response, the Idaho Public Utilities Commission branded him an "outlaw" (Munson, 1985).

At issue is how the existing regulatory climate would influence QF foundings. In a state where the relationship between utilities and regulators was poor, the arguments used by utilities to oppose QF development were likely to be placed in a very critical light or, as in the case of Idaho, to be dismissed altogether. Here, then, it was easier for regulators to strike a more accommodating position toward QFs and improve prospects for foundings. By contrast, in states with a favorable regulatory environment, the tone of the debate over QFs would be less shrill, and the objections of utilities would receive weight in policy deliberations. Thus, the result of the regulatory climate in these states would be more accommodation of utilities, which would translate into less congenial conditions for QFs. The preceding arguments suggest this hypothesis:

H4: The more favorable the regulatory climate for utilities in a state, the lower the rate of QF foundings.

METHOD

Sample and Data

The study period runs from 1980 through 1992, the last year for which data were available. PURPA was passed in 1978, so the year 1979 was selected as the first study year. Because independent variables are lagged, the first year included in data analysis was 1980. The Federal Energy Regulatory Commission (FERC) maintains a data base of filings that QFs must make as a condition of exemption from most aspects of public utility regulation (FERC, 1992). This is a complete roster of all qualifying facilities in the United States and formed the primary source of information. It included information on dates of filing, type of technology used, location of project, and a number of other variables. I considered only the first project initiated by a QF, deleting a small number that represented duplicate filings, later projects at other sites, and projects for which data were missing. Together, these three conditions represented roughly 8.8 percent of all projects. Within the states included in the study, 2,207 organizational foundings were recorded.

Other key data came from a one-page questionnaire sent to state regulatory commissions in 1994 inquiring about state policies toward qualifying facilities and which fuels were used "at the margin" by the typical utility in those states during the study period. For state policies, individuals were asked the year in which the policy was adopted, if ever. For fuel choices, a year-by-year checklist was used, which allowed me to construct a proxy for marginal fuel choices during the study period. State regulatory commissions from the 46 contiguous states were approached (Nebraska and Tennessee have little or no private utility sales, making their inclusion unnecessary), with usable responses received from 35. This 76 percent response rate might be attributed to initial phone calls I made to all commissions, which I used to locate individuals with institutional memory and secure their willingness to participate prior to mailing them a questionnaire. Discussions at this level indicated that recall of facts pertaining to the questionnaire was strong.[2]

Projects were categorized based on whether they used cogeneration or alternative energy technologies. There were nine technologies employed by QFs in the data set. The first three were cogeneration projects using coal, natural gas, or oil as primary fuels. The great majority of these were natural gas projects, and all can be viewed as using proven technologies. The other six technologies, which utilized biomass, geothermal, hydroelectric, municipal solid waste, solar, and wind energy sources, represent alternative energy projects. Evidence that such projects were considered to occupy the technological outskirts and lack legitimacy comes from the California Energy Commission (1981: 103), which discussed the failure of utilities to invest directly in those sources:

> Utilities have been reluctant to take financial risks with alternative electricity technologies not entirely proven by lengthy, reliable, and economic service. Furthermore, utility management is confident that rate regulators will generally recognize investments in conventional technologies as prudent. There is concern, however, that investments in alternatives may not be accorded the same favorable treatment if they do not meet expectations. Finally, development of alternative energy resources would require an unprecedented change in utility responsibility from producers and marketers of centrally generated power to managers of a system with a diversity of small power sources.

Given this view, I treated the two types of organizations as distinct subpopulations of QFs. This also allowed me to consider whether the sensitivity to collective action and preexisting regulatory relations differed across the two subpopulations. If alternative energy projects did lack legitimacy, then the salutary effect of collective action and the debilitating effect of close incumbent-institution relations should both be stronger for that subpopulation.

2
Suchman (1995b) has shown that within a close geographic area, copying of contractual terms takes place, which might indicate that state regulatory commissions "borrowed" language from other states. Although I could not obtain the exact contractual language used in each and every state, I performed regressions that estimated the adoption of state policies as a function of whether or not other states in the same regional power grids had previously adopted these policies. In all estimations, policies in these nearby states had no influence on the propensity of a state to adopt a particular policy.

Measures

For organizational foundings, I used the year in which the FERC was notified that a proposed project was seeking QF status and aggregated by year within each state, recording one observation per state per year. Since independent variables were lagged, 1979 was lost, leaving the years 1980 through 1992 for analysis. The total N is 35 states × 13 years, or 455 observations.

I tested H1 and H2 by considering two key policies whose pattern of adoption differed across states. Here, dummy variables capture whether important terms of exchange had been addressed by state regulators. In each case, theory indicates that adoption of the policy would significantly reduce the transaction costs facing potential entrants. The first policy was whether the term "avoided costs" had been formally defined by the state commission. Without such a definition, a wide range of avoided costs could be claimed, given available information. In the absence of regulatory action, this could lead to disputes over payment terms once electricity was delivered to the utility grid. The second policy was whether standardized contracts had been authorized by the state's regulatory commission. Use of a standardized contract should deflate transaction costs.

Testing H3 required a measure of collective action by qualifying facilities. I formed a dummy variable for the presence or absence of a statewide trade association representing QFs. Such an association would advance the interests of independent power production, consolidating the power and presence of QFs by representing their members—organizations using both alternative energy technologies and cogeneration—through intervention in regulatory hearings, lobbying of legislators, and other collective action.

To test H4, I needed an assessment of the regulatory environment facing utilities in a state. This was available from the Value Line Investment Service, which since the mid-1970s has provided summary ratings of the "regulatory climate" for states. The system uses three categories: below average, average, and above average, in order of improving regulatory relations. Placement into categories reflects procedural and economic policies but is also closely tied to the political environment, since states with elected commissioners are much more likely to have below-average ratings (Samprone and Riddell-Dudra, 1981). To test H4, I included dummies for below-average and above-average rankings in regressions. The hypothesis would be supported if states with below-average ratings experienced more QF foundings and if states with above-average ratings experienced fewer QF foundings.

I controlled for a number of factors in the regression equations. Following Delacroix and Carroll (1983), I expected that prior foundings would positively influence later foundings by signaling that launching a similar project was viable, so the equations include the dependent variable, lagged one year. The state's population was entered to control for size effects. Also included was a variable to capture the effect of the prospective prices for electricity sold to utilities under PURPA contracts. This measure necessitated an estimate of avoided costs by state, starting with questionnaire information that reported, for each year, which fuel (gas, oil, or coal) represented the fuel used at the margin. Although utilities used different fuels at the margin, federal data (e.g., United States Energy Information Administration, 1993) are tabulated in cents per million BTU, allowing the marginal cost to be parameterized such that all fuels could be placed in a common metric. The higher the estimated marginal costs, the higher the avoided-costs payments to qualifying facilities and, hence, the brighter the economic prospect for a proposed project. Values were put into constant dollar terms. Also included was a variable for whether federal tax credits were extended to QF projects, set equal to one when the federal tax credit was available (1979 through 1985). Because tax credits were extended to alternative energy projects but not to cogeneration projects, I expected a positive influence of tax credits on alternative energy projects, but no effect for cogeneration projects. A small number of state legislatures authorized additional tax credits, but information on these policies was extremely sparse, so I did not include this variable in the analysis.

I added a pair of control variables to try to gauge elements of market structure within the state. Both came from a statistical annual produced by the United States Energy Information Administration (1980 and successive years). The first is the ratio of total sales to end users (as opposed to sales to other utilities) to the total electricity generated in the state by the state's privately owned utilities. This is a raw measure, because states are tied into regional power grids from which they draw power, but it should pick up some element of the need for further power and, thus, should be positively related to QF development. The second control variable is a measure of the concentration of utilities within the states. Although each state has a monopoly in its own service territory, if the state's utility system is concentrated in the hands of a small number of producers, they might be able to improve their bargaining against QFs and retard development. I therefore included in the equations the Herfindahl index of concentration for each state, calculated by adding the squared percentages of the share of electric utility sales in the state.

The final set of controls were intended to capture the effect of broader macroeconomic conditions on foundings. Included in equations are the percentage change in the nation's and state's gross domestic product (GDP), and interest rates, measured as the average industrial cost of capital for the year. Change in GDP at both levels should be positively correlated with foundings; interest rates should be negatively related. With the exception of tax credits, which apply only to years for which they are in effect, all other independent variables were lagged by one year.[3]

Analysis

The state was the unit of analysis. I used an event count model to analyze organizational foundings in the independent power industry, adopting a log-linear relationship between foundings and independent variables, following Hannan and Freeman (1989) and others. Under such a specification, a

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Prior studies of foundings generally have included measures of the density of existing organizations. The FERC data set did not permit this specification, as figures were available for initial QF certifications but not for operating facilities. To explore this issue, I ran separate regressions including linear and squared terms for the cumulative number of prior foundings. This approach assumes that the number of operating facilities tracked more or less constantly with these applications. For alternative energy projects, the coefficient on the linear term was negative and the coefficient on the squared term was positive; for cogeneration, the best fitting model contained simply a linear term, whose coefficient was negative. The results for the variables of interest changed little, however, when these proxies for density were included.

common practice in modeling events is to view them as conforming to a Poisson process, but the problem with applying this model to a regression is that its specification requires that the variance and the mean of the expected counts be equal. This is a strong assumption, particularly when unobserved heterogeneity is present (Barron, 1992). Such conditions produce overdispersion, wherein the variance exceeds the mean. Two ways in which overdispersion can typically occur are when the event counts reflect positive contagion, wherein previous events increase the probability of the occurrence of later events, and when unobserved heterogeneity across observations is present.

A solution to this model specification problem is to employ a negative binomial model. The key advantage over Poisson regression is the inclusion of an error term that can be allowed to vary in such a way as to capture the effect of overdispersion in the data. In parameterizing this error term, a common approach (e.g., Carroll and Wade, 1991; Baum and Singh, 1994; Swaminathan, 1995) has been to assume a Gamma distribution, which can accommodate a variety of shapes and is computationally flexible. Specifically, I assumed that the number of foundings in year t, y_t, follows the "true" distribution, represented by the random variable Y_t in the following manner:

$$\Pr(Y_t = y_t) = \exp(-\lambda_t)\, \lambda_t^{y} t / y_t!$$

where the founding rate parameter, λ_t, is related to the vector of covariates, $\mathbf{X}_t$, in the following log-linear fashion:

$$\ln\lambda_t = \alpha + \beta\mathbf{X}_t + \varepsilon_t$$

with ε_t conforming to a Gamma distribution. A remaining issue is the need to estimate how the variance of the expected value changes with the expected value. Here, the following form was used:

$$\mathrm{Var}(Y_t) = f\,[E(Y_t), \theta]$$

where θ is referred to as the overdispersion parameter. Dispersion was modeled as a linear relationship in this study, using the subroutine HILBENB, which operates within the SAS statistical package (Hilbe, 1994). The analytical routines for the analysis employ maximum likelihood techniques to obtain regression coefficients for the variables in the models. To mitigate the possibility of autocorrelation in the data (Barron and Hannan, 1991), a fixed effects model was employed, in which a separate intercept term for each state was inserted into equations. One dummy was omitted to allow for the overall intercept term that appears in tabulated results.

Initial regression analyses showed that when the state policy variables were entered in the equations together, the traits of multicollinearity appeared (i.e., "bouncing betas"). Therefore, I transformed the two state policy variables into a set of four mutually exclusive and collectively exhaustive dummy variables: no contractual assurances, formally defined avoided costs only, approved standard contracts only, and both of these policies together. In the regressions that appear, I omitted the case of no contractual assurances to avoid overdetermination.

RESULTS

Descriptive statistics for the variables of interest are shown in table 1. The annual foundings of alternative energy and cogeneration projects are correlated, which is not surprising given their historical trajectories. Prevailing interest rates, the federal tax credit, and the marginal fuel cost in the state exhibit mutual correlation. To explore whether this correlation changed results of models using these variables together, I ran six regressions (three for each of the two technologies), in which only one of those three variables was included. Relationships strengthened except for two cases. In estimations of alternative energy project foundings, including only the interest rate variable makes the estimate significant and positive. This counterintuitive result is likely due to its picking up the effect of the federal tax credit. In estimations of cogeneration project foundings, the federal tax credit variable became insignificant when included alone. In addition, as might be expected, the two GDP variables are correlated.

Table 1

Descriptive Statistics and Correlation Coefficients*

Variable	Mean	S. D.	1	2	3	4	5	6
1. QF foundings, alternative energy techs.	2.79	7.60						
2. QF foundings, cogeneration	2.06	7.69	.66					
3. State population (millions)	4.39	5.00	.44	.64				
4. Marginal cost in state ($/10^6 BTU)	3.07	1.49	.16	.12	.13			
5. Federal tax credit	0.46	0.49	.16	−.04	−.03	.61		
6. State generating self-sufficiency	1.07	0.29	−.04	−.18	−.22	−.14	.04	
7. State electric utility concentration	6113.19	2592.31	−.08	−.13	−.37	−.11	−.05	.36
8. Change in state GDP (%)	2.41	3.15	.10	.11	−.03	.14	.00	.00
9. Change in national GDP (%)	2.37	2.13	.12	.08	.00	.09	.05	.00
10. Interest rate (%)	10.92	1.90	.10	−.05	−.03	.58	.86	.05
11. Formally defined avoided costs	0.66	0.47	.14	.16	.19	−.26	−.40	−.18
12. Approved standard contracts	0.47	0.50	.06	.14	.04	−.24	−.38	.02
13. Statewide industry association for QFs exists	0.23	0.42	.18	.32	.41	−.08	−.22	−.21
14. Below-average regulatory climate	0.16	0.37	−.08	−.04	−.06	.06	.12	.10
15. Above-average regulatory climate	0.13	0.34	−.04	−.03	.14	.03	.13	.11

Variable	7	8	9	10	11	12	13	14
8. Change in state GDP (%)	.11							
9. Change in national GDP (%)	.03	.59						
10. Interest rate (%)	−.06	−.05	.0					
11. Formally defined avoided costs	−.10	.10	.18	−.43				
12. Approved standard contracts	.33	.14	.11	−.39	.47			
13. Statewide industry association for QFs exists	−.10	.16	.04	−.22	.28	.24		
14. Below-average regulatory climate	−.06	−.13	−.01	.10	−.21	−.04	−.10	
15. Above-average regulatory climate	−.12	.03	−.07	.13	−.03	−.11	.04	−.17

* The total number of observations is 455. Correlations above .10 or below −.10 are significant at $p < .05$.

Removing the national GDP change variable does not result in the state GDP change variable attaining significance in either set of regressions.

Regression results for alternative energy and cogeneration project foundings appear in tables 2 and 3, respectively. Overdispersion in the data, indicated by the parameter, θ, takes on relatively low values in all models. Model 1 is the base run, which includes only control variables. The coefficient on the lagged dependent variable is positive, indicating that positive contagion occurred in this subpopulation. State population does not influence the establishment of alternative energy projects; it may be that size effects are picked up by the lagged variable, or, as is more likely, by the dummy variables included under the fixed effects model. Marginal fuel costs were a significant predictor of alternative energy QF foundings, meaning that direct economic incentives had a potent effect on prospective entrants. The provision of a federal tax credit also had a strong effect, showing that a direct subsidy increased founding rates. But foundings were driven neither by the state's generating self-sufficiency nor by utility concentration. The former result might be due to PURPA itself, which made no mention of how the need for power should work into the QF equation (Bailey, 1995). Neither of the GDP change variables influenced foundings; the interest rate variable also had no effect. Thus, macroeconomic fundamentals had little influence on alternative energy QF foundings.

Model 2 tests H1 and H2, which concern the effect of state policies that influence the context of exchange between alternative energy QFs and utilities. The set of three new variables represents a collective improvement to the model fit, given the decrease in the log likelihood function. The regressions suggest that defined avoided costs is the driving force for new foundings. The coefficient on defined avoided costs is highly significant. The coefficient on the standard contract variable is positive but not significant. And the size of the coefficient on the dummy variable for a state having both policies is of the same magnitude as the coefficient on the dummy variable for defined avoided costs only. Together, these last two results run counter to H2. So support for H1 but not H2 emerges from table 2.

Model 3 tests H3 by adding a variable to capture the effects of collective action by the independent power industry within states. Its coefficient is positive and significant, indicating that founding rates improved in states where QFs organized to act in concert. At this point, one might question whether those state policy variables were the result of collective action. Model 4 approaches this issue with the existing regression framework by removing the state policy variables from model 3. If the QF industry associations affected QF founding rates partly by stimulating the adoption of state policies, then the coefficient on the QF industry association variable should be larger when those state policy variables are excluded. Model 4 shows that this coefficient is virtually identical to the previous model, supporting the idea that collective action worked separately from the state policy variables.[4] From these results one could infer that QF industry

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I thank Associate Editor Don Palmer for suggesting this approach. I explored another possibility, that reverse causality was present, through a separate analysis of collective action for both subpopulations. In it, models 3 and 8 were used, but with one key change: the collective action variable (non-lagged) was used as a dependent variable instead of foundings. In both cases, the coefficient on prior foundings was not a significant predictor of collective action.

Table 2

Negative Binomial Regression Results, Alternative Energy Technologies*

	(1)	(2)	(3)	(4)	(5)
Intercept	1.574	0.253	0.329	1.668*	0.214
	(1.283)	(1.371)	(1.360)	(1.276)	(1.361)
Alternative energy technology QF	0.040***	0.038***	0.034***	0.036***	0.034***
foundings, lagged one year	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
State population	0.079	0.103	0.034	0.001	0.019
	(0.128)	(0.132)	(0.132)	(0.130)	(0.132)
Marginal fuel cost in state	0.192**	0.164**	0.177**	0.213***	0.187**
	(0.082)	(0.087)	(0.086)	(0.082)	(0.087)
Federal tax credit	0.651**	0.722***	0.758***	0.700***	0.774***
	(0.283)	(0.290)	(0.288)	(0.282)	(0.288)
State generating	–0.038	0.002	0.050	0.030	0.082
self-sufficiency	(0.513)	(0.522)	(0.519)	(0.513)	(0.521)
State electric utility	0.007	–0.008	–0.015	–0.008	–0.034
concentration / 1000	(0.111)	(0.114)	(0.114)	(0.112)	(0.115)
Change in state GDP	0.008	0.021	0.013	0.001	0.015
	(0.028)	(0.029)	(0.029)	(0.028)	(0.029)
Change in national GDP	0.046	0.005	0.008	0.046	–0.000
	(0.042)	(0.044)	(0.044)	(0.042)	0.044)
Interest rate	–0.093	–0.010	–0.001	–0.085	0.013
	(0.075)	(0.080)	(0.080)	(0.075)	(0.080)
Formally defined avoided costs		0.765***	0.819***		0.842***
only		(0.294)	(0.291)		(0.292)
Approved standard contracts		0.580	0.660		0.632
only		(0.856)	(0.854)		(0.859)
Both formally defined avoided costs		0.848***	0.746***		0.775***
and approved standard contracts		(0.297)	(0.298)		(0.299)
Statewide industry association			0.679***	0.675***	0.730***
for QFs exists			(0.273)	(0.263)	(0.278)
Below-average regulatory climate					–0.275
					(0.334)
Above-average regulatory climate					–0.559*
					(0.374)
θ	1.02	1.04	1.02	1.00	1.02
–Log likelihood	754.98	750.47	746.81	751.41	745.56
2 x Δ Log likelihood		9.02**	7.32***	7.14***	2.50
Models compared		2 vs. 1	3 vs. 2	4 vs. 1	5 vs. 3

* $p < .10$; ** $p < .05$; *** $p < .01$; one-tailed tests.
* Standard errors are in parentheses.

associations sought something other than contractual assurances for their members. The industry associations' missions may more properly be viewed as seeking to vest their interests within prevailing institutional processes more generally.

Results of model 5 show partial support for H4. Although a poor regulatory climate had no effect on foundings, when regulator-utility relations are closer, the result is reduced QF foundings. The overall change in model fit is not significant, however, so this result must be viewed with caution.

Table 3 reports the results of regression analyses that parallel those of table 2, with cogeneration project foundings as the dependent variable. Here, the data display less overdispersion, indicating that projects were more evenly distributed across time and states. Model 6 shows results for the baseline model. The lagged dependent variable is significant, suggesting that, as with alternative energy projects, contagion occurred for this subpopulation. Consistent with results for alternative energy projects, the state's population does not influence foundings. Marginal costs are highly significant,

Table 3

Negative Binomial Regression Results, Cogeneration*

	(6)	(7)	(8)	(9)	(10)
Intercept	2.241••	1.045	0.770	2.001•	0.580
	(1.271)	(1.366)	(1.362)	(1.271)	(1.345)
Cogeneration QF foundings,	0.019•••	0.024•••	0.022•••	0.017•••	0.022•••
lagged one year	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
State population	–0.105	–0.069	–0.107	–0.143•	–0.100
	(0.101)	(0.100)	(0.101)	(0.103)	(0.098)
Marginal fuel cost in state	0.377•••	0.338•••	0.342•••	0.384•••	0.335•••
	(0.088)	(0.093)	(0.089)	(0.088)	(0.089)
Federal tax credit	–0.489	–0.409	–0.427	–0.490	–0.421
	(0.305)	(0.312)	(0.311)	(0.306)	(0.307)
State generating	–0.717	–0.692	–0.578	–0.614	–0.567
self-sufficiency	(0.561)	(0.574)	(0.574)	(0.563)	(0.566)
State electric utility	0.094	0.089	0.098	0.091	0.091
concentration / 1000	(0.100)	(0.100)	(0.100)	(0.100)	(0.099)
Change in state GDP	–0.019	–0.015	–0.016	–0.021	–0.018
	(0.028)	(0.028)	(0.029)	(0.028)	(0.028)
Change in national GDP	0.129•••	0.105•••	0.099•••	0.124•••	0.100•••
	(0.041)	(0.042)	(0.041)	(0.041)	(0.041)
Interest rate	–0.235•••	–0.191••	–0.163••	–0.211•••	–0.142•
	(0.086)	(0.091)	(0.090)	(0.086)	(0.089)
Formally defined avoided costs		0.928•••	0.978•••		0.944•••
only		(0.314)	(0.315)		(0.314)
Approved standard contracts		0.102	0.154		0.303
only		(1.134)	(1.126)		(1.092)
Both formally defined avoided costs		0.546••	0.486••		0.484••
and approved standard contracts		(0.290)	(0.290)		(0.287)
Statewide industry association			0.505••	0.435••	0.443••
for QFs exists			(0.251)	(0.247)	(0.252)
Below-average regulatory climate					0.388
					(0.311)
Above-average regulatory climate					–0.424•
					(0.316)
θ	0.42	0.40	0.39	0.41	0.36
–Log likelihood	524.17	519.72	517.80	522.68	515.98
2 x Δ Log likelihood		8.90••	3.84•••	2.98•	3.64
Models compared		2 vs. 1	3 vs. 2	4 vs. 1	5 vs. 3

• $p < .10$; •• $p < .05$; ••• $p < .01$; one-tailed tests except for two-tailed test for federal tax credit.

* Standard errors are in parentheses.

demonstrating that prospective payments for power produced had a strong effect on cogeneration foundings. The provision of federal tax credits to alternative energy projects did not have an effect on cogeneration foundings, indicating that support for alternative energy did not drain resources from cogeneration projects. Repeating the result for alternative energy projects, neither self-sufficiency nor concentration is a significant predictor of foundings. Finally, in sharp contrast to results for alternative energy projects, two of the macroeconomic variables, change in national GDP and prevailing interest rates, are both significant and act in the expected direction.

Model 7 adds variables to track the moderating effect of institutional support. For cogeneration foundings, results show a pattern similar to that of alternative energy. A clear definition of avoided costs is a significant predictor of cogeneration foundings, while approval by regulators of standard contracts had no perceptible influence on foundings. Therefore, H1 received support for this subpopulation, but H2 did not. A test for the difference between the states with defined avoided costs and states with both defined avoided costs and standard contracts resulted in no significant difference between the two coefficients ($\chi^2 = 2.10$, $p = .15$).

I carried model 7's specification forward and added the measure of collective action. Results of this regression run are shown in model 8. Consistent with results for alternative energy projects, the coefficient on the collective action variable is a significant predictor of cogeneration QF foundings, supporting H3. To ascertain whether collective action may have influenced state policy variables, I repeated the analysis used for alternative energy projects. Results of model 9 show only a small change in the coefficient on collective action, and it becomes smaller. Thus, there is no evidence that collective action influenced policy for cogeneration projects.

As in results for alternative energy projects that supported H4, an above-average regulatory environment dampened QF foundings. Although the change in log likelihood between model 8 and model 10 is not significant, the difference would have been significant if the above-average regulatory climate dummy alone had been added. It would appear that QFs from neither subpopulation were the beneficiaries of adversarial regulatory climates.

A comparison of the results from models 5 and 10 suggests that the influence of collective action was stronger for alternative energy QFs than for cogeneration QFs. The coefficient on collective action for alternative energy projects was .730, while for cogeneration projects it was .443. At least qualitatively, then, the results show that the value of collective action is greater for the subpopulation that suffered from initial illegitimacy.

DISCUSSION

The results of this study produced varying levels of support for the hypothesized relationships. With respect to defining the terms of exchange, institutional actions to condition exchange by reducing transaction costs were critical to QF development, although standard contracts had no effect. Statewide industry associations spurred foundings, particularly for the alternative energy subpopulation, for which the influence of collective action appeared to be greater. In both subpopulations, states with cozier regulatory relations experienced less QF development of any type, while general macroeconomic indicators were highly influential in predicting cogeneration projects but not alternative energy projects. With respect to other influences on the founding of qualifying facilities, alternative energy projects and cogeneration projects both were fostered by higher prospective energy prices, and alternative energy projects got a clear boost from federal tax subsidies.

The lack of effects for the standard contract variable is puzzling. It may be that there was some imitation involved in the adoption of these contractual mechanisms. If imitation took place, it is possible that standard contracts were adopted as a way for state commissions to appear to be addressing QF issues, a result analogous to the spread of civil service reforms found by Tolbert and Zucker (1983). I considered whether imitation had a geographic basis but found that it did not. Although there are other possible bases for imitation, such as imitation of states of the same size or imitation of states with the same regulatory climates, imitation is only a necessary, not sufficient, condition for standard contracts not protecting QFs. This is because enforcement of breaches of these contracts would have to be lacking in these states as well. Thus, it would be very difficult to associate imitation with these results. It is also unclear why standard contracts would have this property but the definition of avoided costs would not. A possibly more parsimonious explanation for my findings is that the actual language in the standard contracts, and hence their prophylactic value, varied significantly across states. There may be a threshold at which the protective mechanisms incorporated in the standard contract become meaningful.

The strong, positive influence of industry associations on foundings of alternative energy projects is notable. This result is valuable in extending ideas about the intersection of embeddedness and organizational dynamics, an area that remains underdeveloped (Baum, 1996: 95). Previous studies have shown that linkages to institutional elements depress mortality rates (Singh, Tucker, and House, 1986; Baum and Oliver, 1992) and encourage foundings (Baum and Oliver, 1992). My results also show that institutional ties stimulate foundings, but they go further by suggesting that prospective entrants note the value of collective action. Thus, despite the difficulty of organizing collective action in new fields (Olson, 1965), this effort does have the effect of increasing the number of organizations in the field. There may be a point at which collective action shifts to deterring entrance (Carroll and Teo, 1998), but it was not apparent in the years represented in this data set.

The findings of how regulatory climate influences foundings are provocative. When relations between institutional actors and incumbent organizations are endowed with a history of accommodation, threats to those incumbent organizations may well be seen as threats to a system that "works," and the general institutional environment may retard foundings. When preexisting relations are poor, however, the institutional environment is no aid to new entrants. Regulators and utilities may have been at loggerheads in some states, but this did not translate into a welcome mat for the QFs. This result may derive from the relative strength of the vesting of interests within the institutional environment. Strongly vested incumbent interests may deter new entrants from inclusion in policy debates and rule making, but the effect is asymmetric. When incumbents lack strong vesting, policy makers may be able to insulate themselves from any of the various actors with which they interact. It is also possible that when institutions operate in a system wherein environmental change and tumult are articulated directly to those they oversee (Post and Mahon, 1980), the complications that would derive from a more pluralistic institutional context offset any potential value that allies might bring to their struggle with regulated organizations. A desire for simplicity may outweigh the balance that a more complex institutional environment might bring.

The results for one control variable, the provision of tax credits, are of interest because they stand in contrast to Ingram and Inman's (1996) findings on direct institutional support. They found that support targeted to a subpopulation of hotels on one side of Niagara Falls had a positive effect on all hotels, even those on the far side of the falls. They attributed this result to errors in the expectations of institutional actors, who could not guarantee that benefits would be captured by one population but not the other. For qualifying facilities, however, unambiguous targeting made a difference. Thus, inefficacy of targeting may be one factor that explains when institutional change will stimulate unexpected outcomes. As such, targeting is most likely to elicit the desired behavior when the benefits offered accrue privately and discretely, as they did for alternative energy projects.

At present, the electric utility industry appears to be moving toward a mammoth restructuring through measured deregulation (O'Reilly, 1997). Essentially, PURPA was the camel's nose in the tent, revealing the irrelevance of utility ownership of generation. That established, it was a small step for state commissions to force utilities to solicit bids for new power plants to fill future needs. At the same time, large numbers of customers have been pushing to purchase their energy from outside their utility's service territory, relying on the utility simply to transmit and distribute the electricity. De facto vertical disintegration of the electric utility industry is evolving (Joskow, 1997), illustrating again that major upheavals can be instigated by fringe players (Leblebici et al., 1991; Romanelli, 1989). Provided that states carefully regulate the monopolistic functions of transmission and distribution of purchased electricity, electricity generation can emerge from the ashes of regulation as a competitive sector.[5]

Organization Theory and Public Policy

This study shows that policy makers, as institutional actors, can promote the rise and growth of organizations in a new field through the conditioning of relations between exchange partners. The idea that institutional actors and norms play this role has wide applicability. Regulation of industrial sectors is the most obvious example, but there are others. The merger boom at the turn of the century can be traced to the Sherman Antitrust Act, which forbid collusion and price fixing. As such, one of its results was to motivate large mergers: once under the same corporate umbrella, formerly distinct organizations were free to exchange information and other resources as they wished. In a modern setting, Japan's patent system acts to promote cross-licensing, which nurtures interfirm cooperation (McQuade and Gomes-Casseres, 1993). Such institution-level conditions may be what is missing from fields where joint ventures suffer from very high failure rates. Because a critical failing of joint ventures is the inability to fashion contracts that do not stimulate opportunistic behavior by one or more of the partners (Park and Russo, 1996), joint ventures in which exchange relations are imbued

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This article went to press as electricity supply shortages in California reached a crisis. That state's policy initiatives produced a parody of deregulation, in which prices and costs bore no relationship to each other. Due to this blunder and an assortment of other poorly crafted policies that contributed to the disaster, Governor Gray Davis labeled deregulation a "colossal and dangerous failure" (Berenson, 2001). In other states, such as New York and Pennsylvania, where more sensible policies were implemented, the experience has been much better. Like PURPA, as states pursue different electricity policy agendas, policy makers will learn how to deregulate. Poor policies will be discarded, good policies will diffuse widely, and deregulation will be more likely to realize its promise.

with norms of trust through institution-level rules of exchange should outlast others (Hill, 1990).

The study of institutions and interorganizational relations offers a point of contrast between organization theorists with different disciplinary perspectives. Institutional economists generally view the choice of inter- and intraorganizational modes of governance as a reflection of transaction costs inherent in a given context of exchange. But policy initiatives can act to reduce transaction costs or to redress the asymmetries in bargaining power and risk-bearing that can drive up transaction costs. Economic sociologists have been more cognizant of this role for policy and see transaction costs as endogenous, highly variable, and a manifestation of institutional imperatives (Roy, 1997). As demonstrated here, bringing the two perspectives together can offer theoretical value added, because institutional economics provides a framework for identifying the hazards of transacting under various institutional arrangements, while economic sociology explains how institutional change can defuse those hazards.

I believe that a natural consequence of further study of how institutions influence organizational dynamics is that the organization theory field will expand into an important new domain—the consideration of the normative impacts of institutional change. Put another way, a question of central importance to policy makers involved in deregulation in the mid-1970s might have been, "What policies will produce a viable population of alternative energy technologies that use renewable energy to produce electricity?" With one exception (Wholey and Sanchez, 1991), scholars in the population dynamics field have yet to be inspired by normative questions such as this (Tucker, 1994). But scholars have examined a diverse set of empirical contexts with serious public policy implications, ranging from day care centers (Baum and Oliver, 1992) to voluntary social services (Tucker, Singh, and Meinhard, 1990) and labor unions (Hannan and Freeman, 1987). Such a history illustrates that normative analysis of organizational dynamics offers enormous potential. For example, a natural extension of the finding that conditioning exchange relationships can be as critical as direct support in eliciting desired foundings is that the former is often substantially less costly than the latter. Thus, to the extent that results in this context generalize, they show that direct government support may not be the most efficient method for eliciting organizational foundings.

This study showed again that institutional change can produce unintended consequences, but with an important twist. A number of the results from this study conform to the expectations of public policy agents. Defining avoided costs and offering targeted tax credits had the outcomes that were anticipated when they were adopted. Viewed from a distance, however, it is clear that the collective impact of federal and state policies produced a much more fundamental unintended outcome, since the ascendance of an entire industry of independent power producers was largely unforeseen (Joskow, 1988; Serchuk, 1995). As a result, the nation now has considerable experience with building and operating new technologies, such as wind-energy facilities, and high-efficiency technologies, such as cogeneration facilities. Not all unintended consequences of institutional change are negative, as is often presumed.

I began by noting how institutional change parallels geophysical activity, and this study demonstrates how this analogy goes further. Like the occasional earthquake, institutions can generate change of great power and scope. But in both cases, it is a mistake to view such events or their impacts as random, simply because the subtle patterns of causality that underlie them are unknown. As with seismic activity, to accurately predict the impact of institutional change, the topography of cause and effect must be identified and understood. Only by specifying the complex system of institutions, organizations, and actors can organization theorists make confident predictions about the outcomes of policy initiatives. Only then can organization theory maximize its relevance to the practice and study of public policy.

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