Research Paper

Normative and Resource Flow Consequences of Local Regulations in The American Brewing Industry 1845-1918

Working Paper #98003

by
James B. Wade
University of Illinois at Urbana-Champaign
Anand Swaminathan
University of Michigan Business School
Michael Scott Saxon
University of Illinois at Urbana-Champaign

University of Michigan Business School
•
Research Support
•
Ann Arbor, Michigan 48109-1234

RESEARCH SUPPORT
UNIVERSITY OF MICHIGAN BUSINESS SCHOOL

DECEMBER 1997

NORMATIVE AND RESOURCE FLOW CONSEQUENCES OF LOCAL REGULATIONS IN THE AMERICAN BREWING INDUSTRY 1845-1918

WORKING PAPER #98003

BY
JAMES B. WADE
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
ANAND SWAMINATHAN
UNIVERSITY OF MICHIGAN BUSINESS SCHOOL
MICHAEL SCOTT SAXON
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

NORMATIVE AND RESOURCE FLOW CONSEQUENCES OF LOCAL REGULATIONS IN THE AMERICAN BREWING INDUSTRY, 1845-1918

James B. Wade
University of Illinois at Urbana-Champaign

Anand Swaminathan
University of Michigan

Michael Scott Saxon
University of Illinois at Urbana-Champaign

December, 1997

(Forthcoming, *Administrative Science Quarterly*)

• Order of authorship was selected randomly. All three authors made an equal contribution to this paper. We thank Paul Michaud for his research assistance and Guang Guo for providing us with his program for estimating negative multinomial count models. Comments from Terry Amburgey, Joel Baum, Lyda Bigelow, Jack Brittain, Glenn Carroll, Huseyin Leblebici, Joe Porac, and Marc-David Siedel helped sharpen our arguments. Please address all correspondence to Anand Swaminathan, University of Michigan Business School, 701 Tappan Street, Ann Arbor, MI 48109-1234.

NORMATIVE AND RESOURCE FLOW CONSEQUENCES OF LOCAL REGULATIONS IN THE AMERICAN BREWING INDUSTRY, 1845-1918

ABSTRACT

In this study, we investigate the impact of state-level prohibitions on the founding and mortality rates of breweries in prohibition-free states. Our results suggest that particularistic institutional action such as nonuniform Government regulation creates externalities of two kinds. First, it creates resource flow opportunities for organizations that are not directly affected by such action. Second, it imposes indirect coercive pressures by influencing cultural norms in the environment of organizations that are not directly affected by the regulations. We also find that the overall direction and strength of these effects vary with the centrality of organizations in terms of their location, the time elapsed since an environmental change, and organizational age.

Since its emergence, ecological theory has become influential in shifting the focus from adaptation to selection processes in organizational populations, arguing that most change occurs through the founding and failure of organizations, rather than through adaptation by individual organizations (Hannan and Freeman, 1977, 1984, 1989). Early empirical research in this area primarily investigated rates of organizational failure and founding by focusing on demographic processes (Freeman, Carroll and Hannan, 1983), population dynamics (Carroll and Delacroix, 1982; Delacroix and Carroll, 1983), and niche width dynamics (Freeman and Hannan, 1983; Carroll, 1985).

More recently, ecological research has expanded in scope by incorporating the institutional environment into research on vital rates (Scott, 1995: 108-113). For instance, a key component of Hannan's (1986) theory of density dependence is the institutional concept of legitimation or taken-for-grantedness. Similarly, other researchers have examined the effects of how institutional linkages to powerful state actors and favorable government policies can enhance legitimacy and increase access to resources (Singh, Tucker and House, 1986; Baum and Oliver, 1991, 1992; Tucker, Singh and Meinhard, 1990), as well as how regulations that affect only part of an organizational community can lead to unanticipated consequences (Barnett and Carroll, 1993). This study contributes to the growing literature that combines elements of institutional and ecological theory (for a recent review, see Baum, 1996: 94-96). More specifically, this study considers the institutional and ecological impact of a broad class of regulations, those that differ across jurisdictional boundaries.

Government regulations can affect organizational populations in two ways. First, regulations affect resource flows by creating opportunities and constraints for different kinds of organizations within an organizational population (Carroll, Delacroix, and Goodstein, 1988: 375-379). Thus they influence the number and diversity of organizations within a population (Wholey and Sanchez, 1991). Second, regulations exert an indirect effect on organizational populations by creating "cultural expectations or norms in the society within which organizations function" (DiMaggio and Powell, 1983: 150). These normative expectations can have a powerful impact because they embody widely shared beliefs about how people should behave (Scott, 1994). The consequences of institutional action have been studied both from an ecological and institutional theory perspective. Research in these two traditions emphasizes the resource and normative effects of institutional action, respectively. By examining these effects at the same time, this study combines materialist and cultural approaches to the regulatory environment of organizations (Edelman and Suchman, 1997).

Ecological research on institutional action has focused on the impact of government intervention (such as regulations) on resource flows within organizational populations (Hannan and Freeman, 1977). For instance, Wholey, Christianson and Sanchez (1992) show that state regulations requiring health maintenance organizations to file a deposit increased the failure rate of small HMOs by a disproportional amount when compared to large HMOs. Similarly, Baum and Oliver (1992) find that an increase in the budget of the Toronto Social Services Division by the government raised founding rates and lowered failure rates of day care centers in the city. Koza (1988) argues further that regulations are part of the micro niche of an organization's environment. This micro niche provides resources to and exerts demands on a homogenous population of organizations.

Institutional theorists have been mainly concerned with the expectations and norms attached to institutional action (Jepperson, 1992). Organizations conform to rules, not only to acquire resources, but also to be perceived as legitimate (Meyer and Rowan, 1977; DiMaggio and Powell, 1983). This perspective raises the possibility that institutional action such as regulation may induce responses from affected organizations in ways that transcend the stated purpose of such intervening action (Scott, 1994). Edelman (1990, 1992) argues, for instance, that civil rights legislation in the 1960s created a normative environment which encouraged employers to adopt formal grievance procedures for employees, even though the existing laws did not mandate the adoption of such practices. Organizations that did so were perceived as legitimate and were presumably less likely to come under government scrutiny.

One similarity between these two approaches is that both the normative and resource effects of government regulations often generate externalities, that is the private costs and benefits for the decision makers are not the full costs and benefits for the decision (Arrow, 1970; Mansfield, 1985: 473-479, 495-501). For instance, the costs of the HMO legislation studied by Wholey et al. (1992) were borne primarily by small HMOs. Similarly, Edelman (1990, 1992) found that large organizations were most likely to adopt formal grievance procedures (even when not required by law), presumably because of their higher visibility. Externalities play an important role in industry evolution. Delacroix and Rao (1994) argue that the legitimation of an organizational form generates externalities because early entrants bear the costs (and some of the benefits) of legitimating the form. Similarly, Aldrich and Fiol (1994) suggest that one of the essential tasks of early industry entrants is to establish cognitive and sociopolitical legitimacy. One substantive contribution of the present research is that we simultaneously examine the resource and normative effects of regulations and how their effects vary depending on organizational characteristics.

Local regulations are especially likely to create externalities because although they only directly impact the local jurisdiction, the local jurisdiction has interdependencies within the larger system. Moreover, the externalities generated by the normative and resource effects of such legislation are likely to diverge. Consider, for instance, the effect of strict nonsmoking ordinances passed in over 270 local communities in California on the amount of business conducted by restaurants in neighboring communities that are free of such constraints. Local legislation is typically preceded by a protracted struggle between organizations that sponsor the legislation and those that oppose it. Since this process can be highly visible, successful passage of legislation in one political jurisdiction may serve as a catalyst or model for supporters of the law in other political jurisdictions. Local antismoking laws have rapidly diffused through California with more than two hundred being passed in the past two years, and continuing to pass at an average rate of one a week (Newsweek, 1994). These efforts at regulating smoking reflect the growing acceptance of a common set of cultural norms which dictate that smoking is damaging to health and should be discouraged. Thus, the normative effects of local regulations are likely to diffuse across jurisdictional boundaries (Manegold, 1994). In the case of restaurants that are not yet affected by local antismoking ordinances, the rapid diffusion of such laws represents a significant threat of future regulation. Thus, local regulations impose indirect coercive pressures on organizations outside their jurisdiction by influencing cultural norms.

Local regulations can also create resource externalities. Consider, once again, the effect of local smoking bans on the restaurant business. These bans had their intended effect of eliminating smoking in restaurants in affected communities. But the fate of local restaurants is interdependent with that of restaurants in nearby communities. In the absence of uniform anti-smoking laws, it is likely that restaurants in communities that ban public smoking will lose some of their clientele to restaurants in neighboring communities that allow smoking in restaurants (Glover, 1994). Thus local regulations can directly alter patterns of resource flows within an organizational population, creating opportunities for some organizations while imposing constraints on others. Recognizing the potential for the development of such externalities, the California Restaurant Association, a trade group, has lobbied for a state-wide law since 1990 (Romano, 1993). Recently, it sponsored the passage of A. B. 13, a statewide law that prohibits smoking in restaurants starting January 1, 1995 (Sweeney, 1994).

In order to gain a better understanding of the implications of regulations that differ across political boundaries, we study an industry that has been a target of much of this type of regulation -- the American brewing industry. Though our arguments refer specifically to "regulations" they can broadly be applied to "institutional action". We use these two terms interchangeably in the paper. During the 19th and early 20th century, many states enacted laws prohibiting the manufacture and sale of alcoholic beverages. While these laws generally had their intended effects in a given state in that existing producers were shut down, externalities occurred because each state was embedded in a larger economic system. Further, we find that the impact of these regulations was not uniform across organizations, but was dependent on characteristics such as the age and physical location of individual breweries.

The paper is organized as follows. First, we describe trends in prohibition regulation in the American brewing industry. Second, we propose several hypotheses linking the existence and timing of such regulations to organizational founding and mortality in the American brewing industry. Third, we describe the data and methods used to test the hypotheses. Finally, having presented the analytical results, we discuss the implications of our findings for organization theory, particularly the relationship between social movements and institutional action, the effects of institutional action on industry structure, and the linkage between regulations, organizational age and organizational mortality.

PROHIBITION REGULATIONS AND THE U.S. BREWING INDUSTRY

Since the mid 1800s, breweries have faced chronic legitimacy obstacles from proponents of temperance. From 1844 to 1919, anti-alcohol activists succeeded in facilitating the passage of alcohol prohibitions in 34 states, though many of these laws only lasted a few years. The first state prohibition law was passed in 1846 in Maine. The driving force behind this legislation was the pro-prohibition campaigner, Neal Dow, who collected 40,000 names on a petition for prohibition. Contrary to Dow's recommendations, the law prescribed low penalties for offenders and enforcement was lax. Dow drafted a new prohibition bill that rectified the shortcomings of the 1846 law. This bill, known as the Maine law, passed in 1851 and spurred similar efforts by prohibitionists in other states. Between 1851 and 1855, prohibitionists succeeded in passing Maine type laws in twelve other states (Blocker, 1989: 57).

By the 1870s, however, most of these laws had been repealed as the nation became preoccupied with the Civil War and its aftermath. Temperance forces rallied and the Women's Christian Temperance Union was formed in 1874. The WCTU, the Prohibition Party, the Anti-Saloon League, and allied social movement organizations were successful in reinstating prohibition laws in many states and were a force in eventually passing national prohibition in 1919. Figure 1 graphically shows the states that enacted prohibition laws and the time periods during which these laws were enforced.

Insert Figure 1 about here

A prohibition of a good curtails the production, exchange and consumption of a good with the ultimate goal of extinguishing it (Thornton, 1991). Thus, proponents of state prohibitions had two goals. The primary goal was to eliminate the production and consumption of alcohol in their state. The secondary goal was to encourage the adoption of prohibition laws throughout the United States. Prohibition regulations were largely successful in eliminating alcohol manufacturing in a focal state by closing down existing breweries and eliminating brewery foundings. These laws had a much lesser effect on demand, however, because they did not change the tastes or income of consumers directly. Moreover, because states are connected economically to other states through trade and commerce, the elimination of the brewing industry in one state is likely to have an impact on the performance of breweries in neighboring states. Thus, while state-level prohibitions were successful in eliminating the manufacturing of alcohol in the focal state, it is not clear what impact these local laws would have on the founding and failure rates of breweries in states without such laws. In the following section, we develop hypotheses that address this issue.

THEORY AND HYPOTHESES

Resource Effects of Local Regulations

A local regulation such as a state prohibition is likely to have two distinct effects. First, the passage of a state prohibition law reflects anti-liquor sentiment and may serve as a model for activists in other states. Second, the regulation directly affects resource flows. Breweries in the affected state are denied resources and usually shut down. Similarly, breweries in neighboring states that are connected economically to the affected state would be impacted depending on their level of connectedness. Pred (1980) argues that even in the early antebellum period (1840-1860), there were extensive interregional and intraregional economic interdependencies between urban centers. These interdependencies were fueled by the development of the telegraph in 1844 and the continuing expansion of the railroad. Thus, the economic effects of a state prohibition are likely to extend beyond state borders. These interdependencies, however, are likely to decrease with distance. Consequently, the direct economic effects of a state prohibition will be felt most strongly by breweries in neighboring states.

At the local level, the imposition of prohibition in a neighboring state frees up resources and relaxes the competitive pressure on breweries in the focal state. Because of the distances involved and the often large number of breweries, the competitive pressure generated by breweries in adjacent states is likely to be diffuse rather than direct. While both types of competition result from limited resources, direct competition occurs between firms that are aware of each other, while in diffuse competition, the firms are largely anonymous (Barnett and Carroll, 1987; Hannan and Freeman, 1989). With the imposition of prohibition in an adjacent state diffuse competition from neighboring state breweries falls as those breweries are shut down.

We expect, however, that adjacent state prohibitions will have an effect beyond simply the drop in diffuse competition as a result of the brewery failures. Because the entire population of breweries in the adjacent state that has the prohibition perishes, it creates a salient opportunity for brewers in neighboring states to expand their business in order to take advantage of the latent demand in the prohibition state. From the perspective of breweries in a focal state, the passage of a prohibition in a neighboring state is a density-independent event that signals an abrupt change in the carrying capacity (Brittain, 1994). Thus, there exists an incentive for entrepreneurs in neighboring states to found breweries and for existing breweries to develop distribution networks to satisfy this demand. Moreover, breweries in the prohibition state will also have an incentive to shift their production to adjacent states and open new breweries in an effort to recoup their economic loss.

In effect, the onset of a prohibition in an adjacent state is likely to be a triggering event which causes brewers to reevaluate and modify their cognitive model of the market (Porac et al., 1995). In support of this view, Hamm (1995) offers numerous examples of how brewing and liquor interests undertook strategic actions to take advantage of the demand present in prohibition states. For example, express companies were contracted by liquor interests to carry and sell liquor into prohibition states. Because of the opportunities generated by a prohibition in an adjacent state, we expect that the life chances of breweries in neighboring states should rise and foundings should increase. We propose the following hypotheses:

Hypothesis 1a: The greater the number of state-level prohibitions in adjacent states, the higher the founding rate of breweries in a prohibition-free state.

Hypothesis 1b: The greater the number of state-level prohibitions in adjacent states, the lower the mortality rate of breweries in a prohibition-free state.

Normative Effects of Local Regulations

Hannan and Carroll (1992: 146) suggest that while a local level of analysis may be appropriate for analyzing competitive processes, legitimation effects are likely to transcend local boundaries. They argue that institutional processes will diffuse more widely through a social system than the material resources used to build and sustain organizations. Resources such as capital and customers tend to be more localized than norms or cultural norms. In particular, they suggest that the legitimation effect associated with the density dependent theory of organizational evolution applies at a broader level than the competitive component. In analyzing founding rates of automobile manufacturers in Belgium, France, Germany, and Italy, Hannan, Carroll, Dundon, and Torres (1995) find that while legitimation was driven by the density of all European producers, competition was influenced only by the density of home country producers. They conclude that institutional processes such as legitimation operate at a higher level of analysis than competition. Similarly, we expect the impact of changes in resource flows to be localized in comparison to the impact of cultural norms which diffuse more broadly.

To the extent that local prohibitions reflect social norms and the mobilization of public support, they have a normative component, independent of direct resource flows. Legislation does not occur in a vacuum. Social movements coalesce around opponents and proponents of legislation (Meyer and Staggenborg, 1996). Examples abound, and range from the abortion issue (McCarthy, 1987) to nuclear power (Useem and Zald, 1987). And, the influence of these groups has often been substantial. Anti-drunk driving groups, for example, have been very successful in bringing about tougher laws to punish offenders and in changing public attitudes toward drunk driving (McCarthy et al., 1988). In the setting investigated here, social movement organizations such as the Women's Christian Temperance Union and the Anti Saloon League actively lobbied for prohibition while industry groups, including the United States Brewing Association and the National Retail Liquor Dealers Association, opposed such legislation.

Because social movement organizations attempt to mobilize public opinion and gain political allies, legislative success in one jurisdiction may encourage and mobilize like-minded activist groups in others. A successful law serves as a model for social movement organizations in other jurisdictions to emulate. Collective learning occurs as activists in other jurisdictions learn and codify effective routines. Conell and Cohn (1995) found evidence that such a process unfolded in the organization of labor strikes among French coal miners over 1890-1935. A successful strike demonstrated the vulnerability of employers and provided information on effective tactics, which, in turn, led to more strikes. A similar diffusion process seemed to have occurred in the prohibition movement. After the passage of prohibition in Maine, many prohibition supporters in other states patterned their proposed laws after the Maine Law. By 1855, thirteen states had passed what prohibition supporters commonly referred to as "Maine Laws." The formation of national organizations such as the Anti Saloon League and the Women's Christian Temperance Union provided an infrastructure through which the knowledge and tactics of successful prohibitionists could be quickly diffused throughout the country (Kerr, 1985: 122-126; Blocker, 1989: 88-89, 102-16; Bordin, 1990: 72-94;).

Thus, increased legislative success by the prohibition movement would be expected to discourage and damage a countermovement, the brewing industry (see also Hannan and Carroll, 1992: 202-206). Entrepreneurs will be less likely to found new breweries because they fear the loss of their investment. In turn, the life chances of existing breweries will decline as prohibition forces successfully mobilize. Following Hannan et al. (1995), we expect that these effects will occur at a higher level of analysis than resource effects. To avoid confounding this nonlocal institutional effect with the local resource effect (Hypotheses 2a and 2b), we count, for each state, the total number of state prohibitions in force, net of those in adjacent states. We propose the following hypotheses:

Hypothesis 2a: The greater the number of nonlocal state prohibitions in force, the lower the founding rate of breweries in a prohibition-free state.

Hypothesis 2b: The greater the number of nonlocal state prohibitions in force, the higher the mortality rate of breweries in a prohibition-free state.

Resource and Normative Effects of Local Regulations Reconsidered

At the local level, we have argued (in hypotheses 2a and b) that the resource effects of state prohibitions will dominate their normative effects. Alternatively, however, as adjacent states successively impose prohibition, normative processes may become increasingly important even at the local level. Success in a nearby area may energize temperance activists to redouble their efforts. As adjacent states increasingly enact prohibition laws, investors will become wary of investing in a new brewery venture, for fear that their investment will be lost. The spread of prohibition among adjacent states may signal to investors, owners and potential founders that their state may follow the example of its neighbors by enacting a similar law. Thus, while the passage of a prohibition law in a neighboring state may initially reduce competition for breweries, ultimately this effect may be overwhelmed as adjacent states increasingly enact similar laws. On the one hand, we expect the resource effects of state prohibitions to reduce mortality rates and increase founding rates in adjacent prohibition-free states at a decreasing rate. On the other hand, we expect the normative effects of state prohibitions to increase mortality rates and depress founding rates in adjacent prohibition-free states at an increasing rate. We propose the following hypotheses:

Hypothesis 3a: The founding rate of breweries in a prohibition-free state will first increase and then decrease as the number of state-level prohibitions in adjacent states increases.

Hypothesis 3b: The mortality rate of breweries in a prohibition-free state will first decrease and then increase as the number of state-level prohibitions in adjacent states increases.

Brewery Location and the Differential Impact of Prohibition

The effects of legislation are not likely to be uniform across all organizations. Previous research suggests that useful insights can be obtained by partitioning the brewing industry into two subpopulations based on brewery location in either rural or urban areas (Swaminathan and Wiedenmayer, 1991). Carroll and Wade (1991) found that breweries in large cities exerted competitive pressure on rural breweries. But rural breweries did not affect the life chances of city breweries. These findings are consistent with Hawley's (1950) suggestion that large cities, as community centers, exert a controlling influence on outlying areas.

Carroll and Wade (1991) reasoned that city breweries had an advantage over their rural counterparts because of the greater concentration of people and resources found in large cities. For instance, until the development of refrigeration, natural ice was essential to the transportation of beer (Cummings, 1949). Because ice houses (storage areas for natural ice) were located in large cities, city breweries had a locational advantage. Moreover, the existence of plentiful supplies of ice and customers made large cities an attractive target for beer shipments.

Large cities also had greater access to transportation systems such as railroads and waterways for two reasons. First, because they contained a large number of inhabitants in a relatively small area, large cities were the target markets of many products transported by the railroad. Second, the building and maintenance of loading equipment docks and warehouses involved high fixed costs. To amortize these costs over a wider base, it was more economical to ship products through long distribution chains linking inter-regional centers (Hawley, 1950). Similarly, Pred (1980) notes that as early as in the 1850s, important economic linkages were in place between major urban centers. According to Pred's model, early advantages by cities in transportation and manufacturing produced feedback effects which reinforced their dominant status (see also Meyer, 1983 and Krugman, 1991). Thus, the drop in competition resulting from prohibitions in neighboring states should be felt most strongly by urban breweries since they would be targets for interstate trade, more so than rural breweries. In addition, this drop in competition should increase opportunities for entrepreneurs in large cities.

Breweries in large cities will also be in a better position to take advantage of the opportunities presented by a prohibition in an adjacent state. Cities will be more likely to have resident individuals with the skills necessary to develop and manage a more complex distribution system, as well as found new breweries. And, as the competitive threat of neighboring state breweries is eliminated, greater access to transportation networks in large cities will enable the city breweries to reach the population in the prohibition state and their local state population more efficiently and cheaply than rural firms. We propose the following hypotheses:

Hypothesis 4a: Adjacent state level prohibitions will increase the founding rate of breweries located in large urban centers to a greater extent than the founding rate of rural breweries.

Hypothesis 4b: Adjacent state level prohibitions will reduce the mortality rate of breweries located in large urban centers to a greater extent than the mortality rate of rural breweries.

Organizational Age and Environmental Change

The effects of regulations on organizations are not likely to be uniform, but depend on characteristics of the organizations themselves. Organizational age may mediate the impact of the enactment of a prohibition status in an adjacent states. Hannan and Freeman (1984) suggest that organizations that can consistently reproduce their structures and routines and account for their actions are more likely to survive. Not surprisingly, these capabilities increase with age. The ability to reproduce routines consistently also implies that as organizations age, they become increasingly inertial. When organizations do implement major internal change, it will be most disruptive in older organizations. Because older organizations have well developed routines and structures, change is likely to be quite difficult and costly (Hannan and Freeman, 1984). In a recent study of newspaper organizations, Amburgey, Kelly, and Barnett (1993) found that the disruptive effect of changes in goals and marketing strategies increased with age.

While the above discussion concerns direct effects of internal organizational change, a change in the prohibition status of an adjacent state constitutes a major external environmental shock for breweries in a prohibition-free state. The beginning or end of prohibition in a neighboring state substantially changes the competitive environment for breweries. While the beginning of prohibition in an adjacent state does present breweries in a focal state with opportunities for expansion, taking advantage of these opportunities requires major organizational change. Older breweries may be slower to change their strategies and marketing practices than younger breweries and thus be at a competitive disadvantage. Moreover, when older breweries do attempt change it is likely to be more disruptive because their existing routines and structures are more entrenched than those of younger breweries.

Similarly, an end to a prohibition in a neighboring state also represents a substantial change in the environment for breweries in a focal state because it generally brings in a flood of new entrants. Because the newly founded breweries in a state that formerly had a prohibition are closer to customers in that state, breweries in a focal state will need to adjust their strategies to cope with this new competition. There are also likely to be changes in marketing strategy as more legitimate distribution channels become available. Again, younger breweries are more likely to be able to change their existing routines and structures and adjust to the environmental shock. Changes in the prohibition status of adjacent states can thus be viewed as reversals in environmental conditions for breweries operating in a focal prohibition-free state.

On average, changes in the prohibition status of adjacent states are likely to have a negative impact on the life chances of breweries. Hannan and Freeman (1984: 160) argue that internal organizational change recreates a "liability of newness" characterized by conditions that expose new organizations to a higher risk of failure (Stinchcombe, 1965). In the same way that internal organizational change can reproduce a liability of newness, so too can external environmental change. But the detrimental effect of a internal change or an environmental reversal is likely to decline over time as breweries that survive the initial shock modify their routines and adapt. In support of this view, Amburgey et al. (1993) showed empirically that internal organizational change increased the failure rate of Finnish newspapers but that this risk declined over time (see Teo (1994) for similar results). We also expect that older breweries will be at a disadvantage in comparison to younger breweries in adjusting to these events. Because older organizations tend to be more inertial than younger organizations, they are likely to have greater difficulty in adjusting to environmental reversals. We propose the following hypotheses:

Hypothesis 5: Any change in the prohibition status of an adjacent state will increase the mortality rate of breweries.

Hypothesis 6: The greater the time elapsed since a change in the prohibition status of an adjacent state the lower the mortality rate of breweries.

Hypothesis 7: Any change in the prohibition status of an adjacent state will increase the mortality rate of older breweries to a higher degree relative to younger breweries

In testing these hypotheses, we will also examine the effects of the beginnings and ends of prohibitions in neighboring states separately to see if there are differences between the two types of changes. Possibly, the enactment of a prohibition will have a greater effect on failure since firms must utilize illegitimate means to fully take advantage of a prohibition in a neighboring state.

Because the arguments underlying Hypotheses 5, 6 and 7 concern the internal capabilities of organizations, there are no corresponding hypotheses for foundings since the population is the level of analysis in foundings.

DATA AND METHODS

Data

The life-history data on American breweries are taken from a public-use data set compiled and documented by Carroll and Swaminathan (1989). The original source for these data is Bull, Friedrich, and Gottschalk's *American Breweries* (1984) which listed the year of founding and failure for each brewery. These data have been used in previous research on the American brewing industry (Carroll and Swaminathan, 1991; Carroll and Wade, 1991; Carroll et al., 1993; Barnett, 1997). From the life-history data, we were able to calculate for each state and for each year, the number of breweries in operation, the number of breweries founded, and the number of breweries that died. Since our interest lies in modeling the effects of state-level prohibitions on brewery founding and mortality rates, we begin the study in 1845, the year prior to the first state prohibition and end the study in 1918, the year before the Volstead Act (national prohibition) was passed. The passage of the Volstead Act marks a natural endpoint for our study since it marks the end of the state prohibition movement[1]. After the repeal of the Volstead Act, there were few organized efforts to pass state prohibitions and these were never successful.

---

[1] An anonymous reviewer suggested that because of the large number of state prohibitions enacted at the end of this period, the results could be driven by an outlier effect. Consequently, we reran all of the analyses using 1916 as the end point of the study. Our results are not sensitive to the choice of end point.

We obtained data on the timing of each state prohibition from Friedrich and Bull (1976). As with much previous research that models period effects (Hannan and Freeman, 1989), we use dichotomous measures to model the onset of prohibition. Using such a research strategy assumes that the effects of these prohibitions did not vary across time or across jurisdictions. Undoubtedly, this assumption is violated to some extent. State statutes obviously differed in their content and in the degree to which they were enforced. For example, a few states such as Tennessee included a "dispensary" clause which with the approval of a physician allowed the purchase of alcohol for "medicinal" purposes. We feel, however, that a dichotomous measure is justified since these statutes shared more similarities than differences. All placed significant restrictions on the sale and purchase of alcohol and were recognized as prohibitions during the periods specified by multiple sources. (Cherrington, 1920; Friedrich and Bull, 1976; Sechrist, 1985). Moreover, because these statutes differ, in usually minor ways, on multiple dimensions distinguishing between them would be a daunting and perhaps impossible analytic task. Because of the similarities between these prohibitions we take the more parsimonious approach of using a dichotomous measure[2].

For each state, we computed the number of state-level prohibitions in adjacent states, calling it the number of local prohibitions. We also calculated the total number of state-level prohibitions in force each year. To avoid confounding this measure with the local prohibition variable, we subtracted the number of local prohibitions for each focal state from it, thus creating a nonlocal prohibition variable. We also construct a dummy variable coded one after 1913, indicating that the Webb-Kenyon Act had passed. This act, passed

---

2 It is also possible that the degree to which these laws are enforced may vary between states and affect their relative impact. While such information is not available for this setting and is a limitation of the current study, this may be a promising avenue for future research. In particular, enforcement data are likely to be available for regulations intended to protect the natural environment.

by the federal government, formally prohibited the transport of alcohol through a state if that state had a prohibition in force.

State population data are based on estimates provided by the U.S. Bureau of the Census every ten years. Annual estimates were obtained by assuming a constant yearly compound growth rate over each decade. If the earliest population figure date was after 1845, it was extrapolated back to 1845 using the growth rate for the earliest decade that was available. We also reran the analyses using straight line interpolation between decades and the results were not affected. The population and number of breweries in states adjacent to a focal state were summed to arrive at cumulative measures of adjacent state population and adjacent state brewery density. We also included the brewery density in non-adjacent states. State population, the number of adjacent states, state brewery density, state brewery density squared, state brewery foundings, state brewery deaths, adjacent state population, adjacent and non-adjacent state brewery density were used as control variables in both the founding and mortality analyses. Including the focal state's brewery density in the analyses is particularly important since competition could clearly impact failure rates. For the founding analyses we also included a dummy variable denoting the end of a focal state's prohibition because it is likely that there will be a proliferation of entrants following the repeal. Similarly, in the mortality analysis, we include a variable denoting the beginning of a focal state's prohibition since all existing breweries either suspend operations or exit the industry.

In order to test hypothesis 4a, we had to differentiate city foundings from rural foundings. Because we are estimating three distinct rates (foundings in rural areas, foundings in large cities, and foundings in very large cities) and thus have three distinct counts, we constructed three datasets.[3] The first data set used counts of foundings in large cities (250,000 to 500,000 people), the second data set contained foundings in very large cities (greater than 500,000 people), while the third used counts of foundings in rural areas (cities of less than 250,000). During this period, these were common categories used by the U.S. Bureau of the Census to differentiate large cities from small ones. This type of hierarchical measure, often used by urban geographers, is dynamic in that cities can enter and leave different size classes over time (Northam, 1979). Using several size classes is desirable because it is difficult to assess, a priori, what size constitutes a large city. To test hypothesis 4a, we compared the coefficients on the number of adjacent states under prohibition for the three samples. Hypothesis 4a is supported if the coefficient on this variable is the smallest in rural areas and significantly larger in the urban samples.

In testing hypothesis 4b, which predicted that neighboring prohibitions would decrease the mortality rate in large cities, we differentiated breweries located in large cities from their rural counterparts by including two dummy variables at the organization level indicating whether a brewery was located in a large city or a very large city. We then tested the hypothesis by interacting the dummy variables with the number of adjacent states under prohibition.

To test hypotheses 5 and 6 we construct a dummy variable that equals one (and remains one thereafter) once an adjacent state enacted a prohibition and a clock denoting the elapsed time since a change in the

---

[3] In modeling rural and city brewery founding rates separately, we assume that the rates are independent of each other. Our interest here is to see if the effects of adjacent state prohibitions on brewery foundings varies in rural and urban areas. If we were interested in modeling interdependence between the rural and urban brewery sub-populations, then we could model cross-density effects on the rural and urban brewery founding rates.

prohibition status of any adjacent state. With the help of these two variables, we can model both the immediate disruptive effect of a change in the prohibition status of an adjacent state and our expectation that this effect declines as time elapses. Amburgey et al. (1993) introduced this modeling strategy to unravel the immediate and long-term effects of internal organizational change on organizational mortality. Our specification of the impact of changes in the external environment, however, has less variation than the organization-level changes modeled by Amburgey and colleagues because changes in the Prohibition status of adjacent states exert a common impact on all breweries in a focal state.

Hypothesis 7 proposed that older organizations will suffer higher failure rates relative to younger organizations as the prohibition status of adjacent states changes. To test this hypothesis, we constructed a variable that took on the value of the age of the firm at the time of the last change in the prohibition status of an adjacent state. For example if an adjacent state ended a prohibition and a firm was five years old, this variable would be assigned a value of five until another change in prohibition status of an adjacent state. If no adjacent states experienced prohibition this variable would remain zero.

Because past studies using these data have included industry age, dummy variables denoting the beginning and end of prohibitions, and a dummy variable indicating that a firm was founded in 1874, we include them in our analyses (see Carroll and Swaminathan, 1991 for more details on these control variables).

Methods

For organizational foundings, the unit of analysis is the brewing industry at the state level. Thus, each state has an observation for each year during the period of the study. Observations are not recorded for states while a state-level prohibition is in force. The dependent variable, then, is the number of brewery foundings in each state in each year. In order to test hypothesis 5a, we differentiated between foundings in rural areas, large cities and very large cities and treated counts of the three types of founding events as separate outcomes.

A common technique used for modeling event counts is to assume that the event counts follow a Poisson distribution. The Poisson model has a significant weakness, however, because it assumes that the variance of expected event counts equals the mean. In many cases, however, this is a faulty assumption because unobserved heterogeneity and positive contagion can cause overdispersion (the variance of the expected event counts to exceed the mean) (Barron, 1992). In the presence of overdispersion, the Poisson model can produce erroneously small standard errors, and the negative binomial model is the preferred alternative (Cameron and Trivedi, 1986; Barron, 1992).

Both Poisson and negative binomial models assume that event counts are independent. Barron (1992) described generalized quasi-likelihood estimation procedures to model event counts that are autocorrelated. This method, however, can only be applied to a single time series of event counts. Because our data contain multiple time series of brewery foundings clustered by state, using this method would produce errors in the correction for autocorrelation. In this study, we follow Guo (1996) who used a random effects model to estimate counts of a medical procedure performed in 175 hospitals in each quarter between 1988 and 1991. In Guo's (1996) study, the quarterly observations contributed by a hospital are unlikely to be independent. But conditional on a hospital-specific random effect, the quarterly counts from the same hospital can be treated as independent. In our study we have counts of brewery foundings in 49 clusters (48 mainland states and the District of Columbia). A random effects model for such clustered count data is given by

$$\mu_{ij}(\theta_i) = T_{ij} \, exp\,(x'_{ij}\beta)\, \theta_i \,, \qquad (1)$$

where θ_i is a state-specific random effect, $\mu_{ij}(\theta_i)$ is the mean count for observation j in state i, and T_{ij} is exposure for observation j in state i. In our analysis T_{ij} is set to one, that is we assume that all states have equal exposure. This model assumes that the count random variables in the ith state are mutually independent given a state-specific random effect θ_i. A negative multinomial regression model can be obtained by assuming that the random effect θ_i in equation (1) has a gamma distribution with density

$$f(\theta_i) = \theta_i^{\phi-1} exp(-\phi\, \theta_i)\, \phi^{\phi} / \Gamma(\phi) \qquad (2)$$

so that the mean equals one and the variance is $\sigma^2 = \phi^{-1}$.

We used a maximum likelihood estimation program written by Guo (1996) along with the numerical optimization package GQOPT (Quandt, 1997) to estimate negative multinomial models of state-level brewery foundings.

For organizational mortality, we use the individual organization as the unit of analysis. As noted above, our original source listed each breweries year of founding and year of failure. Because our independent variables were updated yearly each brewery's life-history was broken into annual spells with all but the last spell being censored on the right. Imprecise knowledge of the exact date of failure results in time aggregation bias. Following Petersen's (1991) recommendation, we construct our spells so that failures occur in the midpoint of the period. Earlier studies using these data that were conducted before Petersen's work was published or widely disseminated assumed that failures occurred at the beginning of the year. Because we only know the year in which a brewery failed, we assume that brewery failure occurred during the midpoint of the year. Thus a brewery which existed from 1850 to 1851 would have one spell instead of two. While we use the more "correct" method here, our results are robust to either specification. Thus, if a brewery was born in 1850 and died during 1851, we would construct two spells. The first spell would cover the period from 1850 to 1851 while the second would be from 1851 to 1851.5. We also include a dummy variable to indicate left-censoring for breweries that were alive before 1845, the beginning of our observation period. Time-varying covariates are updated at the beginning of each year for each organization.

Following previous ecological research, we estimate a firm-specific instantaneous mortality rate assuming that the mortality rate of an organization declines with the natural logarithm of age (Hannan and Freeman, 1989). The model is specified as follows:

$$\mu(t) = \exp[\beta \mathbf{X}'(t)] \exp[\gamma \ln(t)]$$

where $\mu(t)$ is the instantaneous mortality rate for an organization at age t and $\mathbf{X}'$ is a vector of independent variables that vary with organizational age. The effect of covariates on the organizational mortality rate was estimated using Tuma' s (1980) RATE program.

RESULTS

Table 1 reports means, standard deviations, and the range for the variables included in the founding and mortality analyses. The descriptive statistics for a given variable differ across the two analyses because foundings and mortality rates are analyzed at different levels of aggregation. As noted earlier, the founding analysis is conducted at the state level, while the mortality analysis uses the organization as the unit of analysis.

Insert table. 1about here

Table 2 shows the effects of prohibition in other states on the founding rate of breweries in a prohibition-free state. All models in table 2 include the effects of variables shown by earlier research to influence the founding rate of American breweries (see Carroll and Swaminathan, 1991). In addition, the baseline model includes the following control variables: state population, the number of adjacent states, adjacent state population, adjacent and non-adjacent state brewery density, and a dummy variable denoting the passage of the Webb-Kenyon act.

Model 1 shows that the passage of the Webb-Kenyon Act in 1913 which formally prohibited the transport of alcohol through states that had imposed prohibition discouraged brewery foundings. Surprisingly, model 1 generates results that are contrary to hypothesis 2a which predicted that as the number of nonlocal state-level prohibitions increased, the founding rates of breweries in prohibition-free states would decline. Upon further analysis, in model 2 we find that the effect of nonlocal prohibitions on the founding rate is actually nonmonotonic. Apparently, as prohibition forces gained momentum, entrepreneurs were initially more likely to found new breweries, but were ultimately discouraged with the spread of state-level prohibitions. From the coefficient estimates in model 2, nonlocal prohibitions discouraged brewery foundings once sixteen or more nonlocal states imposed prohibition. Thus nonlocal prohibitions seem to affect the state-level brewery founding rate in the same way as the adjacent state prohibitions discussed below.

Insert table 2 about here

Model 3 investigates the effects of prohibitions in neighboring states on foundings (hypothesis 1a). We find that a prohibition in an adjacent state spurs entrepreneurs to found breweries as hypothesis 1a predicts. Importantly, the effects on the founding rate of the number of nonlocal prohibitions and the Webb-Kenyon period remain negative and significant. Model 4 tests whether the effect of local prohibitions is nonmonotonic. Hypothesis 3a predicts that as the first adjacent state enacts a prohibition, entrepreneurs perceive it as an opportunity and found new organizations. As more adjacent states enact prohibitions, however, entrepreneurs become wary of investing in a new enterprise because they fear the diffusion of prohibition laws to their state. The addition of the squared term for the number of adjacent states with prohibition in model 4 supports this reasoning. Now, the linear term associated with the number of adjacent states with prohibition remains positive and significant, while the squared term is negative and significant. Using the estimates in model 4, we find that as the first three adjacent states enact prohibition, breweries are more likely to be founded, but as subsequent states enact prohibitions, foundings decline. Importantly, the point at which normative effects begin to dominate is well within the range of our sample. Models 5, 6, and 7 separately estimate the founding rates for rural and urban foundings. Consistent with hypothesis 4a, models 5 and 6 show that the effect of the number of adjacent states with prohibitions on brewery foundings in large cities is more than five times the effect on brewery foundings in rural areas. Using a comparison of means test (Wonnacott and Wonnacott, 1970: 275), we find that the difference between the coefficients is statistically significant (for earlier applications of this test see Miner, Amburgey, and Stearns, 1990: 704; Rao and Neilsen, 1992: 464; and Baum and Oliver, 1996: 1411). We also find that the effect of the number of adjacent states with prohibitions on foundings is significantly stronger in very large cities than in rural areas. Comparing models 6 and 7, however, we find contrary to hypothesis 4a, that the effect of the number of adjacent states with prohibitions on brewery foundings in large cities also exceeds its effect on brewery foundings in very large cities. Overall, then we find mixed support for hypothesis 4a.

It may also be important to control for the speed at which surrounding states pass prohibitions. In models not shown here, we constructed two additional variables and substituted them separately into the key mortality and founding models. The first variable was defined as the number of adjacent states with prohibitions (in the current year) which imposed these prohibitions in the current year, while the second was the number of adjacent states with prohibitions that adopted these prohibitions within the previous five years. Although these variables were sometimes significant, they did not affect the results reported here.

The mortality analyses are presented in table 3. Once again, we include variables shown by earlier research to significantly affect the mortality rate of U.S. breweries (see Carroll and Swaminathan, 1991). As in the case of the founding analyses, the baseline model of organizational mortality includes the following control variables: state population, the number of adjacent states, adjacent state population, adjacent state brewery, non-adjacent state brewery density, and the passage of the Webb-Kenyon Act.

In model 1, we add to the baseline model variables indicating the number of nonlocal prohibitions and the passage of the Webb-Kenyon Act. Consistent with hypothesis 2b, we find that the greater the number of nonlocal prohibitions, the higher the mortality rate of breweries in a prohibition-free state. Brewery mortality does not seem to affected by the passage of the Webb-Kenyon Act. Model 2 investigates the impact of the number of adjacent states enacting prohibitions on brewery mortality (hypothesis 1b). While the estimate is in the expected negative direction, it is not significant. Model 3 tests for a nonmonotonic effect of the variable measuring the number of adjacent states with prohibitions on the mortality rate. Consistent with hypothesis 3b, the passage of a local state prohibition initially decreases failure rates. As the number of adjacent prohibitions continues to rise beyond three, however, the mortality rate increases. Again, this threshold is well within the range of our sample[4].

---

[4] An anonymous reviewer suggested that because the maximum number of adjacent states with prohibition is six that we should use categorical indicator variables to test for nonmonotonic effects. Although not reported here, the results remain substantively the same for both the mortality and founding analyses when this approach is used.

Hypotheses 2a and 2b suggested that as the number of nonlocal prohibitions increased, founding rates would fall and mortality rates would increase. Similarly, hypotheses 3a and 3b predicted that eventually as the number of adjacent prohibitions continued to increase, many more breweries would fail and fewer would be founded. The logic underlying these hypotheses was that legislative success in one jurisdiction may mobilize activists in others. In supplementary analyses not reported here, we found support for this underlying logic. State-level adoption of prohibition laws increased with the number of nonlocal prohibitions and the number of state-level prohibitions in adjacent states. In addition, we found that the impact of adjacent state prohibitions on the adoption of state-level prohibition was less evident in states with higher brewery densities, suggesting that the brewing industry served as a countermovement to the prohibition movement. The supplementary analyses reinforce our interpretation of the results shown in tables 2 and 3.

Insert table 3 about here

Model 4 adds dummy variables identifying breweries located in large cities. Consistent with the findings of Carroll and Wade (1991), the main effect of being located in a city is detrimental to organizational survival, indicating that breweries in cities operate in a more competitive environment than their rural counterparts. Model 5 investigates whether the failure rate of breweries in large cities falls as prohibitions are enacted in neighboring states. Confirming hypothesis 4b, the interaction between adjacent state prohibitions and the variable indicating that a brewery is located in a city of over 500,000 people is negative and highly significant. In fact, once two adjacent states enact prohibitions, the positive main effect on mortality of being located in a very large city is canceled out and city breweries benefit in the aggregate from prohibition in adjacent states. The interaction between the number of adjacent prohibitions and being located in a large city (250,000 to 500,000 people) is also negative but not significant. The fact that this effect is much weaker than the previous estimate for the largest cities supports hypothesis 4b, in that the larger the city, the greater the beneficial effects of prohibition in a neighboring state.

Model 6 includes a dummy variable that equals one (and remains one thereafter) once an adjacent state enacted a prohibition and a clock denoting the elapsed time since a change in the prohibition status of any adjacent state. Recall that a change is defined as occurring whenever a neighboring state enacts or repeals a prohibition. As predicted by hypothesis 5, any change in the prohibition status of an adjacent state increases the mortality rate of breweries in the focal state. The magnitude of this effect is substantial -- estimates from model 6 suggest that the mortality rate of breweries increased by 37.8% as a result of a change in the prohibition status of an adjacent state.[5] In addition, we find strong support for hypothesis 6 -- the deleterious impact of environmental reversals such as changes in the prohibition status of adjacent states declines over time.

We find no support for hypothesis 7. While the effect of an environmental reversal is moderated by the age of the brewery at the time of such an event, older breweries, rather than younger ones, have significantly lower mortality rates when faced with the same environmental reversal. Further the point estimates in model 6 suggest that breweries that are greater than or equal to 28 years in age actually derive a net benefit

---

5 The effect of any covariate on the organizational mortality rate can be expressed in terms of a multiplier of the baseline rate. This multiplier is obtained by exponentiating the coefficient estimate associated with the covariate. In the case of the dummy variable signifying a change in the prohibition status of an adjacent state, the multiplier of the mortality rate is 1.378 (or $e^{.322}$). The relative increase in mortality with respect to the baseline rate is equal to 38% and is calculated as follows: ((1.38-1) X 100).

in terms of lower organizational mortality as a result of changes in the prohibition status of adjacent states. Of the 6,370 breweries included in our analysis, 1,246 breweries survived for a period of 28 years or longer. In our data, the maximum age at which such an environmental reversal occurs is 128 years. For this brewery, the multiplier effect of a change in the prohibition status of an adjacent state on the mortality rate is 0.865 which implies a 13.5% reduction in the mortality rate as a result of this environmental reversal.

This result is striking since it is seemingly inconsistent with Amburgey et al.'s (1993) finding that older newspapers suffer higher mortality rates following internal changes in strategy and goals[6]. Perhaps, however, this difference is due to the fact that from the perspective of individual organizations, the environmental changes considered here involve transitions between only two possible state-spaces -- the existence and nonexistence of adjacent state prohibitions (Barnett & Carroll, 1995: 226-228). On the other hand, changes in marketing strategy and goals, such as those studied by Amburgey et al. (1993) have many more possible state spaces. Moreover, these changes could occur in any order. For example, in the case of the Finnish newspapers studied by Amburgey et al. (1993), a newspaper could first change its content from a general content newspaper to a specialist political newspaper and then to a specialist economic newspaper.

Possibly, changes that are often repeated and that involve transition between a limited number of state spaces offer greater opportunities for learning. In this setting, through cumulative learning, older breweries may be more likely to have developed effective routines to neutralize the life-threatening effects of reversals in environmental conditions. Over the period of the study, there were 49 state prohibitions

---

6 Amburgey et al. (1993) note, however, that the main effect of age overwhelms the change effects such that the net hazard rate resulting from a change decreased as the newspaper aged.

whose mean duration was 9.6 years. While this is a relatively long period, it is well within the range of brewery ages in the industry. Of the 6,370 breweries included in our analysis, 2,945 lived ten years or longer. These older breweries are likely to have experienced several such prohibitions in adjacent states and had more opportunities for learning than younger firms.

In order to explore this possibility further, we computed for each year the cumulative number of adjacent state prohibition changes that each firm had experienced up to that point in time. This measure reflects the number of opportunities that a given firm had for learning. Model 7 substitutes this measure for firm age at time of a change in adjacent prohibition status. As can be seen the greater a firm's experience with adjacent state prohibition changes, the lower the mortality rate. Possibly then, the negative effect of a firm's age at the time of a change in adjacent state prohibition status on mortality was due to older firms' greater opportunities for learning. In models shown here we do not include the age at the time of a change in prohibition status and the cumulative number of adjacent state prohibition changes experienced by a firm in the same model because of their high multicollinearity (r=.82). In models where both were included, only the age variable was significant. Possibly, the number of cumulative changes experienced by firms does not entirely capture the effects of cumulative learning. At the same time, however the high intercorrelation between the two variables makes any effort to distinguish between their effects questionable. In any case, the results in model 6 and 7 of table 3 should be viewed with some caution.

Models 8 and 9 investigate the effects of ends and beginnings of prohibitions in adjacent states. The effects are comparable to the results obtained when both changes are examined simultaneously except that the end prohibition change variable is not significant, although it is in the expected direction. Possibly, prohibition beginnings are more disruptive because firms must utilize illegitimate means to fully take advantage of the opportunities presented by a prohibition in an adjacent state.

One possible problem with the mortality analyses is that we did not control for brewery size. The omission of this variable calls into question our results for hypotheses 5,6 and 7 because it is reasonable to expect that older breweries might be larger. In addition, because larger breweries tend to be located in large cities, it could also confound our results for large cities. Although comprehensive size data for the entire period is not available, Salem (1880) collected data on brewery sizes in 1878 and 1879. In order to evaluate the sensitivity of our results, we reestimated model 6 from table 3 using Salem's 1879 size data. We started the analysis in 1879 assuming that each brewery's size remained constant until its demise. In supplementary analysis not shown here, we reestimated model 6 from table 3 using the data as constructed above. We find that, consistent with earlier research, size has a negative effect on mortality rates (Carroll and Swaminathan, 1991). More importantly, all our hypothesized effects remain significant in the expected direction. Overall, the robustness of these results is quite striking, given the restricted time frame and the much lower number of observations in this analysis.

DISCUSSION

Overall, the results are highly supportive of the hypotheses. Essentially, while coercive pressures in the form of regulations can be successful within a local jurisdiction, it can result in externalities if these regulations are not uniform across jurisdictions. The findings in the brewing industry indicate that while state legislators could successfully close down in-state breweries through prohibition laws, externalities were generated in the wider system. The overall impact of nonlocal and adjacent state prohibitions on the founding and mortality rates provides some intriguing results. Figure 2 uses coefficient estimates from model 4 in table 2 to plot their effects on the founding rate. A value of the multiplier that is less than one signifies that the particular combination of the two covariates depresses the founding rate.

Insert figure 2 about here

We see from figure 2 that as long as three or fewer adjacent states impose prohibition, the resource flow benefits outweigh the negative normative effects. But at high levels of nonlocal prohibitions or when the number of adjacent state prohibitions is greater than three, the founding rate is depressed due to the negative normative effects.

Figure 3 uses coefficient estimates from model 6 in table 3 to plot the effects of nonlocal and adjacent state prohibitions on the mortality rate.

Insert figure 3 about here

Figure 3 shows that the overall impact of state-level prohibitions on the mortality rate differs considerably from its effect on the founding rate. The negative normative impact of adjacent and especially nonlocal prohibitions overwhelms any resource benefits that may accrue from adjacent state prohibitions. The imposition of prohibition in more than four nonlocal or adjacent states accelerates the mortality rate of breweries. This result implies that breweries are not adversely affected by the normative pressures of regulations only for a brief period early in the diffusion of state-level prohibitions. Figures 2 and 3 together suggest on the one hand that resource flow benefits from nonuniform regulations have a substantial impact on organizational founding rates and play a minor role in explaining organizational mortality. On the other hand they suggest that the normative pressures of nonuniform regulations influence organizational mortality rates to a much larger extent.

This study not only describes the differential impact of resource flow and normative pressures on organizational founding and mortality, but also sheds light on the relationship between social movements and institutional action, the effects of institutional action on industry structure, and the linkage between environmental reversals, organizational age and mortality. We address these issues below.

Social Movements and Institutional Action

These findings illustrate that local legislation can have both normative and resource effects on organizations. Moreover, these forces do not always act in the same direction. The resource effects of these types of regulations are felt locally. As potential competitors in neighboring states are eliminated, state-level prohibitions in adjacent states initially increased the founding rate and improved the life chances of breweries in prohibition-free states. Normative pressures represented by nonlocal prohibitions and a continued increase in the number of neighboring prohibitions act in the opposite direction -- they lower the founding rate and raise the mortality rate of breweries in prohibition-free states. Thus, the overall impact of local regulations depends upon the relative strength of resource and normative processes.

Overall, these findings present policy makers and social movement organizations sponsoring legislation with a difficult strategic choice. One strategy involves campaigning for legislation that applies uniformly across jurisdictions, say the entire United States, by focusing resources at the national or federal level. For example, the passage of the Wagner Act at the federal level in 1935 provided extensive legal protection to union organizing efforts across the country. A second strategy is to gather support and momentum for a particular legislative agenda by initially concentrating on its passage in local jurisdictions which offer the widest base of support. Intuitively, the second choice seems more likely to succeed because it only requires limited resources, and local success may generate a bandwagon effect. Our findings suggest, however, that the normative pressures implicit in the bandwagon effect must be evaluated against the resource externalities that it generates. For instance, we estimate that as many as seventeen nonlocal prohibitions are required to eliminate the positive impact of one adjacent state prohibition on brewery foundings in prohibition-free states.[7]

The resolution of the difficult choice between the pursuit of particularistic or universalistic legislation revolves around the speed of the bandwagon effect, that is the rate at which local legislation diffuses through local jurisdictions. If this diffusion process is sufficiently rapid, the externalities generated by the resource effects are likely to be overwhelmed by those produced by the normative effects of local legislation. Possibly, the ultimate failure or success of this type of legislation may be a path dependent process in which early successes or failures have a large impact on the outcome (Arthur, 1989). Unbundling the factors which drive the externalities created by local legislation may be a fruitful area for future research.

Industry Structure

The results also suggest that institutional action may have powerful and perhaps unanticipated consequences for industry structure. Improvements in technologies such as refrigeration and transportation are typically cited as explanations for trends that show increasing concentration in the brewing industry. Our results show that local prohibitions may have independently contributed to industry concentration by providing greater opportunities to existing breweries located in the largest cities. Moreover, due to greater access to resources and other locational advantages, urban breweries tended to be larger. For instance, production data collected by Salem (1880) for 1878 show that breweries in the two major urban centers in Pennsylvania, Pittsburgh and Philadelphia, averaged 7317 barrels of beer, whereas

---

7 Similarly, if Wagner Act-like labor laws were legislated in some states and not others, they would likely have led to employment shifts to states where employers are not subject to such constraints.

rural breweries in Pennsylvania averaged only 4322 barrels. Thus, prohibitions in adjacent states benefitted breweries in large cities and likely led to increasing industry concentration both in terms of geographic location and in terms of brewery size.

Of course, these effects on industry concentration are somewhat trivial if they can be reversed easily after local prohibitions are repealed. But a path-dependent view of industry evolution suggests that small or chance events can have far reaching effects in the presence of increasing returns to a particular choice (Arthur, Ermoliev, and Kaniovski, 1987; Arthur, 1990). For instance local prohibitions may serve as a chance event that provides initial advantages to breweries located in prohibition-free states and particularly in their cities. The beneficial effects of initial locational choice may be multiplied manifold due to the existence of increasing returns in the form of scale economies. In the context of the brewing industry, Scherer (1980) argues that economies of scale in marketing and production magnified the advantages accruing to large firms. Because large firms tended to be located in cities, early advantages such as those created by local prohibitions, may have enabled these firms to outdistance their rivals in rural areas. Importantly, even when the main effect of an additional adjacent state prohibition diminishes the life chances of breweries, it impacts rural organizations to a much greater extent than those located in large cities. Further, a cursory examination of state-level trends in the number of breweries suggests that a viable brewing industry failed to establish itself in states that were subject to prolonged periods of prohibition. Thus, local prohibitions may have unwittingly transformed a highly fragmented industry into a highly centralized one dominated by a smaller number of firms. If local regulations have permanent effects on industry structure, their incorporation in public policy decisions could turn into a self-defeating exercise.

Ultimately, temperance supporters achieved their goal of national prohibition, albeit temporarily, with the passage of the Volstead Act in 1919. As many as 709 of the 934 breweries that were founded in 1933-34 after the repeal of national prohibition were restarts of breweries that were alive before national prohibition began. Post-prohibition data indicate that of these 709 restarts, sixteen were still alive at the end of 1992. In contrast only two of the 223 startup firms that entered the industry after repeal survived until the end of 1992. A comparison of the average time to failure of the two kinds of firms that entered the industry in 1933-34 is even more striking. Among breweries that exited the industry, the mean lifetime for restarts was 14.6 years while it was only 4.4 years for startups. One explanation for these differences is that a significant number of restarts conserved their organizational capabilities by operating in other related lines of business during prohibition (Baron, 1962). For example, many firms sold yeast or non-alcoholic beer. Still others produced soft drinks. Because these endeavors utilized much of the same equipment and products were sold through existing distribution channels, restarts may have had a survival advantage over newly founded breweries[8]. The locational distribution of these restarts likely reflected the effects of state-level prohibitions imposed earlier in the industry's history. Whether nonuniform regulations have permanent imprinting effects on the evolution of organizational populations is an issue that deserves greater attention.

Organizational Age and Environmental Change

This study also contributes to the growing literature on the consequences of change. Whereas most previous research has emphasized the deleterious short-run impact of internal organizational change (Hannan and Freeman, 1984, 1989; Amburgey et al., 1993), we investigate the impact of a major

---

[8] An alternative explanation is that restarts had survival advantages because these firms tended to be generalists and had access to greater resources. In this industry, however, the historical evidence indicates that restarts abandoned their other lines of business following the repeal of national prohibition.

environmental reversal, a change in the prohibition status of an adjacent state. The results show that whi the immediate effect of a change in the prohibition status of an adjacent state is to increase the mortality rate of breweries, this effect is moderated by the age of the brewery. The effect of environmental reversal on older breweries is less pronounced and for breweries above a certain age these environmental shifts actually seem to enhance survival. While Amburgey et al. (1993) show that internal organizational chang is more disruptive to older organizations (relative to younger organizations), we find that older organizations capitalize on environmental reversals. We suspect that these inconsistent results reflect the possibility that the environmental reversals featured in this study have a limited number of state spaces, thus allowing older organizations to develop routines to deal with such changes. Investigating whether some types of changes offer greater opportunities for firm learning may be a fruitful area for future research.

CONCLUSIONS

Overall, we find that particularistic institutional action embodied in nonuniform regulations influences organizations through two distinct processes. At the local level, nonuniform regulations affect resource flows and thus impact organizations based on their level of connectedness to the affected area. If these regulations constrain organizations within a particular jurisdiction, organizations in surrounding jurisdictions that are not directly affected benefit due to a reduction in competitive pressure. Organizations in regulation-free jurisdictions that are centrally located with respect to the broader organizational field derive greater benefits from the initial reduction in competitive pressure. At the nonlocal level, however, the diffusion of nonuniform regulations represents changes in societal norms and expectations as various interest groups contest for primacy. The greater the number of jurisdictions adopting the regulations, the greater the probability that the normative effects will dominate the resource effects in jurisdictions that are not directly affected by the regulations.

Our finding that the normative effects of regulations operate nonlocally provides support for recent assertions that institutional processes diffuse more broadly than resource flow based processes (Hannan and Carroll, 1992; Singh, 1993). While Hannan et al. (1995) provided empirical evidence that the legitimation component of the density-dependent model operates at a higher level of analysis than the competitive component, we believe that this is the first study that empirically examines this process in the context of regulations. Changes in the regulatory status of adjacent jurisdictions represent reversals in the external environment of organizations in regulation-free jurisdictions. Older organizations are less adversely affected by such environmental reversals and may even benefit from them. Thus, in order to understand the consequences of particularistic institutional action, researchers and policy makers must attend to its resource and normative effects on different kinds of organizations.

As in previous research that combines institutional and ecological theory to explain organizational outcomes, we have treated institutional action in the form of Government regulation as exogenously determined. A more complete explanation would require an analysis of the timing and content of institutional action. It is clear in the context of the brewing industry and in other contexts that institutional action is often the result of a contest between competing interest groups (Gouldner, 1954: 27, 237; DiMaggio, 1988: 11-12; Klandermans, 1992: 94-100; Wolfson, 1995; Meyer and Staggenborg, 1996; Russo, 1997; Ingram, 1998). Thus the institutional environment is at least partially endogenously determined by affected interest groups or organizational populations (Edelman and Suchman, 1997: 488-490 and 501-502). Our current research addresses this issue in two ways. First, we examine the diffusion of prohibition regulations as the outcome of a contest between supporters of such regulations such as the WCTU and opponents such as the brewing industry. Second, we study the impact of opposing organizational populations comprised of local chapters of the WCTU and the brewing industry on each other's evolution. We hope to report results from these studies as they become available.

REFERENCES

Aldrich, Howard E., and Marlene C. Fiol

1994 "Fools rush in? The institutional context of industry creation." Academy of Management Review, 19: 645-670.

Amburgey, Terry. L., Dawn Kelly, and William P. Barnett

1993 "Resetting the clock: The dynamic of organizational change and failure." Administrative Science Quarterly, 38: 51-73.

Arrow, Kenneth J.

1970 "Political and economic evaluation of social effects and externalities." In Julius Margolis (Ed.) The Analysis of Public Output: 1-30. New York: National Bureau of Economic Research. Distributed by Columbia University Press.

Arthur, W. Brian

1990 "Positive feedbacks in the economy." Scientific American, 262: 92-99.

Arthur, W. Brian, Yuri M. Ermoliev, and Y. M. Kaniovski

1987 "Path dependence processes and the emergence of macro-structure." European Journal of Operational Research, 30: 294-303.

Barnett, William. P.

1997 "The dynamics of competitive intensity." Administrative Science Quarterly, 42: 128-160.

Barnett, William. P. and Glenn R. Carroll

1987 "Competition and mutualism among early telephone companies." Administrative Science Quarterly, 32: 400-421.

1993 "How institutional constraints affected the organization of early U.S. telephony." Journal of Law, Economics, & Organization, 9: 98-126.

1995 "Modeling internal organizational change." In J. Hagan and J. S. Cook (Eds.), Annual Review of Sociology, 21: 217-236. Palo Alto, CA: Annual Reviews, Inc.

Baron, Stanley

1962 Brewed in America, Boston, MA: Little, Brown and Company.

Barron, David N.

1992 "The analysis of count data: Overdispersion and autocorrelation." In Peter V. Marsden (ed.), Sociological Methodology, Volume 22: 179-220. Oxford: Basil Blackwell. Published for the American Sociological Association.

Baum, Joel A.C.

1996 "Organizational ecology." In Stewart R. Clegg, Cynthia Hardy, and Walter R. Nord (eds.), Handbook of Organization Studies: 77-114. Thousand Oaks, CA: Sage.

Baum, Joel A. C., and Christine Oliver

1991 "Institutional linkages and organizational mortality." Administrative Science Quarterly, 36: 187-218.

1992 "Institutional embeddedness and the dynamics of organizational populations." American Sociological Review, 57: 540-559.

1996 "Toward an institutional ecology of organizational founding." Academy of Management Journal, 39: 1378-1427.

Blocker, Jack. S., Jr.

1989 American Temperance Movements: Cycles of Reform. Boston, MA: Twayne Publishers.

Bordin, Ruth

1990 Woman and Temperance: The Quest for Power and Liberty. New Brunswick: Rutgers University Press.

Brittain, Jack

1994 "Density-independent selection and community evolution." In Joel A.C. Baum and Jitendra V. Singh (Eds.), Evolutionary Dynamics of Organizations: 355-378. New York: Oxford University Press.

Bull, Donald, Manfred Friedrich, and Robert Gottschalk

1984 American Breweries. Trumbull, CT: Bullworks.

Business Week

1994 "Tobacco: Does it have a future?" Business Week, July 4, 1994, p 24.

Cameron, Colin A., and Pravin K. Trivedi

1986 "Econometric models based on count data: Comparisons and applications of some estimators and tests." Journal of Applied Econometrics, 1: 29-53.

Carroll, Glenn R.

1985 "Concentration and specialization: Dynamics of niche width in populations of organizations." American Journal of Sociology, 90: 1262-1283.

Carroll, Glenn R., and Jacques Delacroix

1982 "Organizational mortality in the newspaper industries of Argentina and Ireland: An ecological approach." Administrative Science Quarterly, 27: 169-198.

Carroll, Glenn R., and Anand Swaminathan

1989 "Documentation for public-use data set on American breweries." Working paper, Center for Research in Management, University of California at Berkeley, Paper No. OBIR-37.

1991 "Density dependent organizational evolution in the American brewing industry from 1633 to 1988." Acta Sociologica, 34: 155-175.

Carroll, Glenn R., and James B. Wade

1991 "Density dependence in the organizational evolution of the American brewing industry across different levels of analysis." Social Science Research, 20: 271-302.

Carroll, Glenn R., Jacques Delacroix, and J. Goodstein

1988 "The political environments of organizations." In Barry M. Staw and L.L. Cummings (eds.), Research in Organizational Behavior, 10: 359-392. Greenwich, CT: JAI Press Inc.

Carroll, Glenn R., Peter Preisendoerfer, Anand Swaminathan, and Gabriele Wiedenmayer

1993 "Brewery and brauerei: The organizational ecology of brewing." Organizational Studies, 14: 155-188.

Cherrington, Ernest Hurst

1920 The Evolution of Prohibition in the United States of America. Westerville, OH: The American Issue Press.

Conell, Carol and Samuel Cohn

1995 "Learning from other people's actions: Environmental variation and diffusion in French coal mining strikes, 1890-1935." American Journal of Sociology, 101: 366-403.

Cummings, Richard Osborn

1949 The American Ice Harvests: A Historical Study in Technology, 1800-1918. Berkeley, CA: University of California Press.

Delacroix, Jacques, and Glenn R. Carroll

1983 "Organizational Foundings: An ecological study of the newspaper industries of Argentina and Ireland." Administrative Science Quarterly. 28, 274-291.

Delacroix, Jacques, and Hayagreeva Rao

1994 "Externalities and ecological theory: Unbundling density dependence." In Joel A.C. Baum and Jitendra V. Singh (Eds.), Evolutionary Dynamics of Organizations: 255-268. New York: Oxford University Press.

DiMaggio, Paul. J.

1988 "Interest and agency in institutional theory." In Lynne G. Zucker (ed.), Institutional Patterns and Organizations: Culture and Environment: 3-21. Cambridge, MA: Ballinger.DiMaggio, Paul J., and Walter W. Powell.

DiMaggio, Paul J., and Walter W. Powell

1983 "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields." American Sociological Review, 48: 147-160.

Edelman, Lauren B.

1990 "Legal environments and organizational governance: The expansion of due process in the American workplace." American Journal of Sociology, 95: 1401-1440.

1992 "Legal ambiguity and symbolic structures: Organizational mediation of Civil Rights law." American Journal of Sociology, 97: 1531-1576. Palo Alto, CA: Annual Reviews, Inc.

Edelman, Lauren B., and Mark C. Suchman

1997 "The legal environments of organizations." In John Hagan and Karen S. Cook (eds.), Annual Review of Sociology, 23: 479-515.

Freeman, John, and Michael T. Hannan

1983 "Niche width and the dynamics of organizational populations." American Journal of Sociology, 88: 1116-1145.

Freeman, John, Glenn R. Carroll, and Michael T. Hannan

1983 "The liability of newness: Age dependence in organizational death rates." American Sociological Review, 48: 692-710.

Friederich, Manfred, and Donald Bull

1976 The Register of United States Breweries, 1876-1976, Volumes 1 and 2. Trumbull, CT: Bullworks.

Gouldner, Alvin W.

1954 Patterns of Industrial Bureaucracy. Glencoe, IL: Free Press.

Greene, William H.

1990 LIMDEP, Version 6.0 Users Manual and Reference Guide. Bellport, NY: Econometric Software, Inc.

Glover, K.

1994 "Restaurateurs breathe easy as smoking ban spreads." Los Angeles Business Journal, August 1, 1994, Volume 16, Number 30, Section 1, Page 3.

Guo, Guang

1996 "Negative multinomial regression models for clustered event counts." In Adrian E. Raftery (ed.), Sociological Methodology, Volume 26: 113-132. Oxford: Basil Blackwell. Published for the American Sociological Association.

Hamm, Richard E.

1995 Shaping the 18th Amendment: Temperance Reform, Legal Culture, and the Polity. Chapel Hill, NC: University of North Carolina Press.

Hannan, Michael T., and Glenn R. Carroll

1992 Dynamics of Organizational Populations: Density, Legitimation, and Competition. New York: Oxford University Press.

Hannan, Michael T., and John Freeman

1977 "The population ecology of organizations." American Journal of Sociology, 82: 929-964.

1984 "Structural inertia and organizational change." American Sociological Review, 49: 149-164.

1989 Organizational Ecology. Cambridge, MA: Harvard University Press.

Hannan, Michael T., Glenn R. Carroll, E. A. Dundon, and J. C. Torres

1995 "Organizational evolution in a multinational context: Entries of automobile manufacturers in Belgium, Britain, France, Germany, and Italy." American Sociological Review, 60: 509-528.

Hawley, Amos H.

1950 Human Ecology. New York: Ronald Press Company.

Ingram, Paul

1998. "Changing the rules: Interests, organizations, and institutional change in the U.S. hospitality industry." In Mary C. Brinton and Victor Nee (eds.), The New Institutionalism in Sociology : 258-276. New York: Russell Sage Foundation.

Jepperson, Ronald L.

1992 "Institutions, institutional effects, and institutionalism." In Walter W. Powell and Paul J. DiMaggio (eds.), The New Institutionalism in Organizational Analysis: 143-163. Chicago: The University of Chicago Press.

Kerr, K. Austin

1985 Organized for Prohibition: A New History of the Anti-Saloon League. New Haven, CT: Yale University Press.

Klandermans, Bert

1992 "The social construction of protest and multiorganizational fields." In Aldon D. Morris and Carol C. Mueller (eds.), Frontiers in Social Movement Theory: 77-103. New Haven, CT: Yale University Press.

Koza, Mitchell P.

1988 "Regulation and organization: Environmental niche structure and administrative organization." In Nancy DiTomaso and Samuel B. Bacharach (eds.), Research in the Sociology of Organizations, 6: 183-201. Greenwich, CT: JAI Press.

Krugman, Paul R.

1991 "Increasing returns and economic geography." Journal of Political Economy, 99: 483-499.

Manegold, Catherine S.

1994 "Becoming a land of the smoke-free, ban by ban." New York Times, March 22, 1994, Tuesday, Late Edition - Final, Section A, Page 1, Column 2.

Mansfield, Edwin

1985 "Microeconomics: Theory and Applications, 5th edition. New York: W.W. Norton & Company, Inc.

McCarthy, John D.

1987 "Pro-life and pro-choice mobilization: Infrastructure deficits and new technologies." In Mayer N. Zald and John D. McCarthy (eds.), Social Movements in an Organizational Society: 49-66. New Brunswick, NJ: Transaction Publishers.

McCarthy, John D., M. Wolfson, D. P. Baker, and Elaine Mosakowski

1988 "The founding of social movement organizations: Local citizens' groups opposing drunken driving." In G. R. Carroll (ed.), Ecological Models of Organizations: 71-84. Cambridge, MA: Ballinger.

Merton, Robert K.

1936 "The unanticipated consequences of purposive social action." American Sociological Review, 1: 894-904.

Meyer, David R.

1983 "Emergence of the American manufacturing belt: An interpretation." Journal of Historical Geography, 9: 145-174.

Meyer, David S., and Suzanne Staggenborg

1996 "Movements, countermovements, and the structure of political opportunity." American Journal of Sociology, 101: 1628-1660.

Meyer, John W., and Brian Rowan

1977 "Institutionalized organizations: Formal structure as myth and ceremony." American Journal of Sociology, 83: 340-363.

Miner, Anne, Terry Amburgey, and Timothy Stearns

1990 "Interorganizational linkages and population dynamics: Buffering and transformational shields." Administrative Science Quarterly, 35: 689-713.

Northam, Ray M.

1979 Urban Geography (Second Edition). New York: Wiley.

Porac, Joseph R, Howard Thomas,Fiona Wilson, D. Paton and Alaina Kanfer.

1995 "Rivalry and the industry model of scottish knitwear producers," Administrative Science Quarterly, 40: 203-227.

Pred, Allen R.

1980 Urban Growth and City-Systems in the United States, 1840-1860. Cambridge, MA: Harvard University Press.

Quandt, Richard E.

1997 GQOPT Version 6.12 Handbook. Department of Economics, Princeton University, Princeton, NJ.

Rao, Hayagreeva, and Eric H. Neilsen

1992 "An ecology of agency arrangements: Mortality of savings and loan associations, 1960-1987." Administrative Science Quarterly, 37: 448-470.

Romano, M.

1993 "California smoking ban clears its first hurdle; CRA seeks statewide uniformity of laws on puffing." Restaurant Business Magazine, May 1, 1993, Volume 92, Number 7, Page 28.

Russo, Michael V.

1997 "Institutions and early population dynamics: Independent power production in America, 1978-1992." Working paper, Lundquist School of Business, University of Oregon.

Salem, Frederick William

1880 Beer, its History and its Economic Value as a National Beverage. Hartford, CT: Salem.

Scott, William R.

1994 "Institutions and organizations: Toward a theoretical synthesis." In W. Richard Scott, John W. Meyer, and associates (eds.), Institutional Environments and Organizations: Structural Complexity and Individualism. Thousand Oaks, CA: Sage.

1995 Institutions and Organizations. Thousand Oaks, CA: Sage.

Sechrist, R. P.

1985 Prohibition movement in the United States, 1801-1920 (ICPSR 8343). Machine-readable data file. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Singh, Jitendra V.

1993 "Review Essay: Density Dependence theory--current issues, future promise." American Journal of Sociology, 99: 464-473.

Singh, Jitendra V., David J. Tucker, and Robert J. House

1986 "Organizational legitimacy and organizational mortality." Administrative Science Quarterly, 31: 587-611.

Stinchcombe, Arthur L.

1965 "Social structure and organizations." In James G. March (ed.), Handbook of Organizations: 142-193. Chicago: Rand McNally.

Swaminathan, Anand, and Gabriele Wiedenmayer

1991 "Does the pattern of density dependence in organizational mortality rates vary across levels of analysis? Evidence from the German brewing industry." Social Science Research, 20: 45-73.

Sweeney, J. P.

1994 "Landmark smoking law signed by Wilson." The San Diego Union-Tribune, July 22, 1994, page A-1.

Teo, A.C.Y.

1994 "Innovation and firm longevity: The experience of American automakers, 1880 to 1981." Unpublished Ph.D. dissertation, University of California at Berkeley.

Thornton, Mark

1991 The Economics of Prohibition. Salt Lake City: University of Utah Press.

Tucker, David J, Jitendra V. Singh, and Agnes G. Meinhard

1990 "Organizational form, population dynamics, and institutional change: The founding patterns of voluntary organizations." Academy of Management Journal, 33: 151-178.

Tuma, Nancy B.

1980 Invoking RATE. Menlo Park, CA: SRI International.

Useem, Michael, and Zald, Mayer N.

1987 "From pressure group to social movement: Efforts to promote use of nuclear power." In Mayer N. Zald and John D. McCarthy (eds.), Social Movements in an Organizational Society: 273-288. New Brunswick, NJ: Transaction Books.

Wholey, Douglas R., Jon B. Christianson, and Susan M. Sanchez

1992 "Organization size and failure among health maintenance organizations." American Sociological Review, 57: 829-842.

Wholey, Douglas R., and Susan M. Sanchez

1991 "The effects of regulatory tools on organizational populations." Academy of Management Review, 16: 743-767.

Wolfson, Mark

1995 "The legislative impact of social movement organizations: The anti-drunken-driving movement and the 21-year-old drinking age." Social Science Quarterly, 76: 311-327.

Wonnacott, T. J., and R. H. Wonnacott

1970 Econometrics. New York: Wiley.

FIGURE 1

TIMING OF STATE PROHIBITIONS

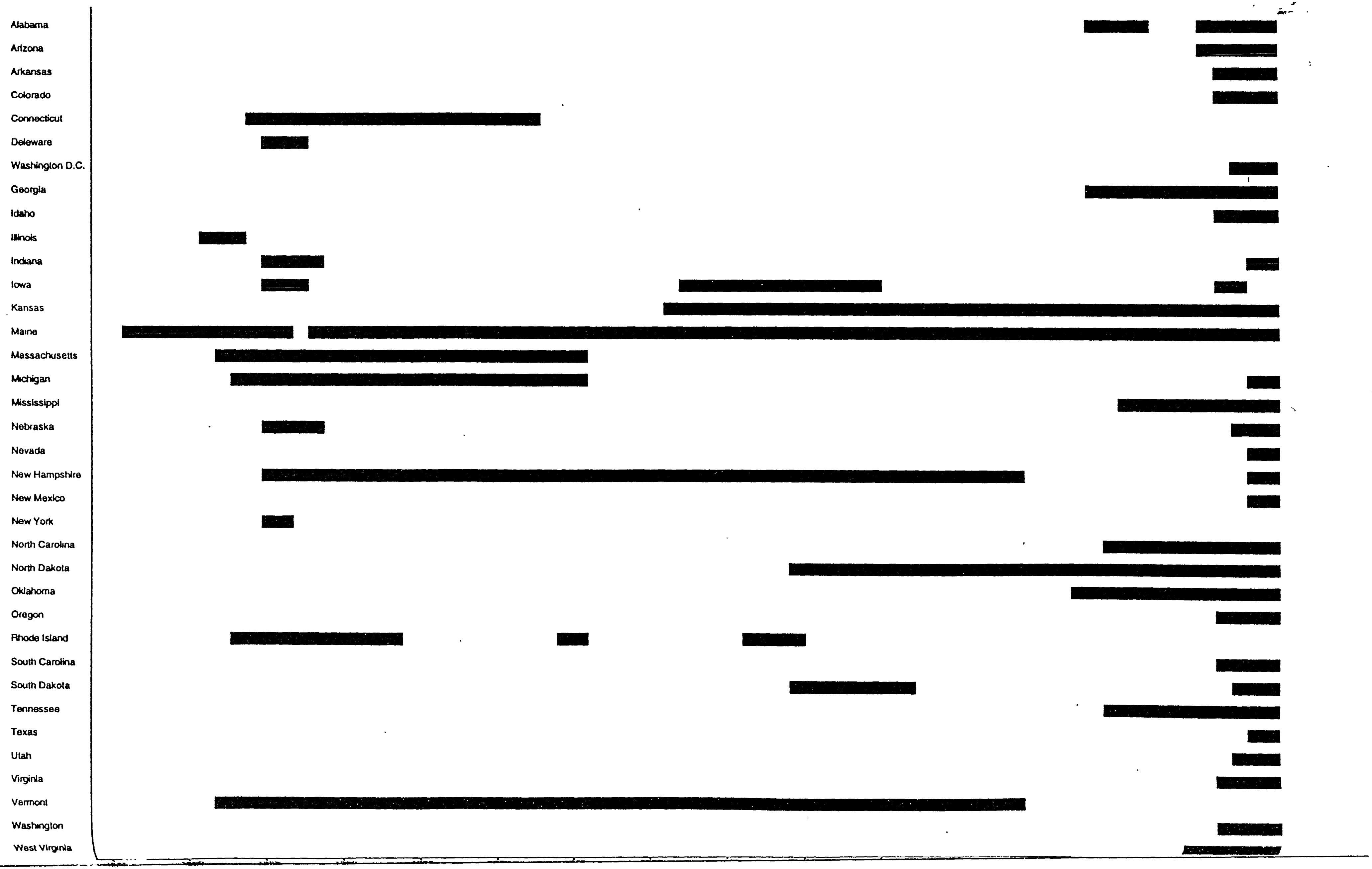

Figure 2. Effects of State-Level Prohibitions on the U.S. Brewery Founding Rate: 1845-1918.

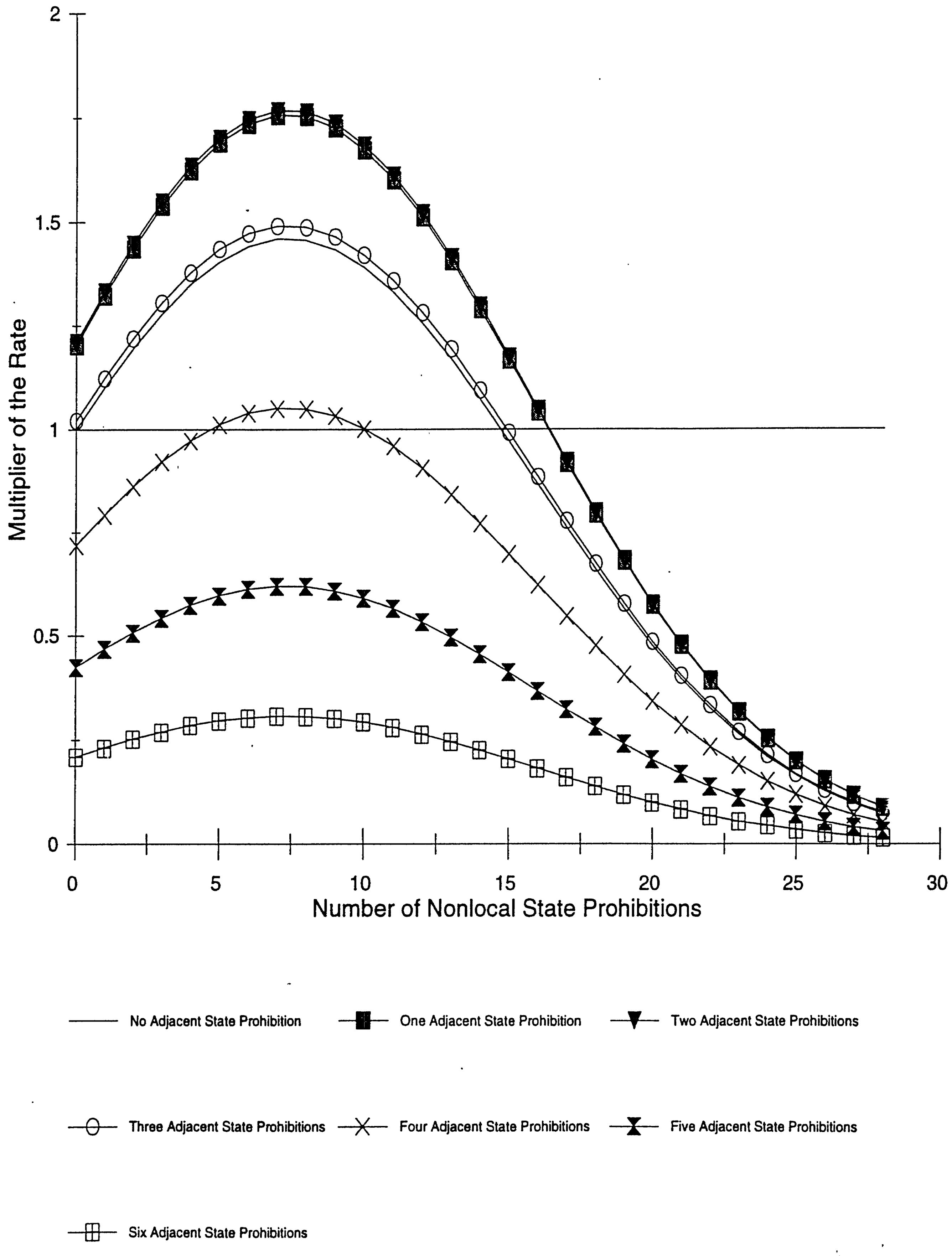

Figure 3. Effects of State-Level Prohibitions on the U.S. Brewery Mortality Rate: 1845-1918.

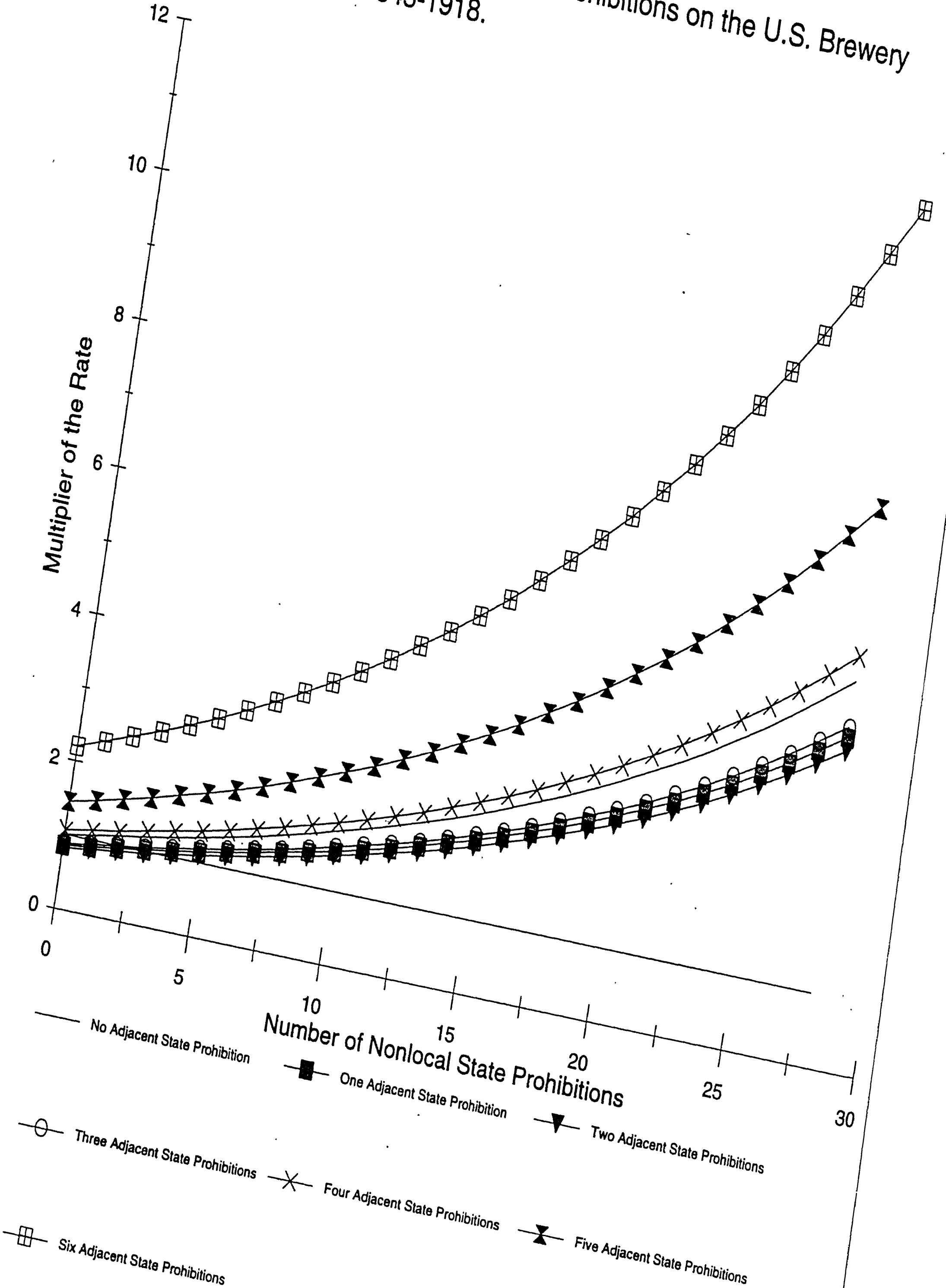

TABLE 1

Descriptive Statistics for Founding and Mortality Analyses

Founding Analysis

Variable	Mean	S.D.	Minimum	Maximum
End of Prohibition	0.01	0.08	0.00	1.00
Dummy for 1874 Founding	0.01	0.12	0.00	1.00
Year After 1912 (Webb-Kenyon Act)	0.07	0.25	0.00	1.00
Industry Age	35.73	21.20	0.00	73.00
State Density	30.66	56.10	0.00	383.00
State Births	1.94	8.09	0.00	192.00
State Deaths	1.55	5.22	0.00	127.00
# of Nonlocal Prohibitions	5.73	3.65	0.00	28.00
State Population (thousands)	1130.75	1388.16	0.09	9986.00
# of Adjacent States	4.58	1.57	1.00	8.00
# of Adjacent States with Prohibitions	0.32	0.73	0.00	6.00
Adjacent State Density	135.43	152.44	0.00	767.00
Adjacent State Population (thousands)	5373.37	4693.70	3.18	23799.15
Non-Adjacent State Density	1176.66	659.90	32.00	2756.00

Mortality Analysis

Variable	Mean	S.D.	Minimum	Maximum
Begin Prohibition	0.01	0.08	0.00	1.00
Dummy for 1874 Founding	0.16	0.37	0.00	1.00
Year After 1912 (Webb-Kenyon Act)	0.07	0.26	0.00	1.00
Industry Age	42.94	16.64	0.00	73.00
State Density	131.00	95.33	0.00	383.00
State Births	7.83	20.59	0.00	192.00
State Deaths	6.01	10.94	0.00	127.00
# of Nonlocal Prohibitions	5.76	3.61	0.00	28.00
State Population (thousands)	2911.00	2228.00	2.19	9986.00
# of Adjacent States	4.79	1.25	2.00	8.00
# of Adjacent States with Prohibitions	0.48	0.79	0.00	6.00
Adjacent State Density	298.30	169.70	0.00	767.00
Adjacent State Population (thousands)	8494.00	4970.00	9.96	23800.00
Non-Adajacent State Density	1265.00	504.80	32.00	2756.00
Large City (250K - 500K)	0.08	0.27	0.00	1.00
Very Large City (Over 500K)	0.13	0.34	0.00	1.00
Change in Adjacent State Prohibition Status	0.84	0.37	0.00	1.00
Time Since Change in Adjacent State Prohibition	13.02	14.24	0.00	61.00
Age at Time of Change in Adjacent State Prohibition	7.73	13.16	0.00	128.00
# of Adjacent State Prohibition Changes Experienced	1.57	2.23	0.00	17.00
Start of Adjacent State Prohibition	0.84	0.37	0.00	1.00
Time Since Start of Adjacent State Prohibition	18.34	16.39	0.00	64.00
Age At Start of Adjacent State Prohibition	5.01	10.91	0.00	128.00
End of Adjacent State Prohibition	0.81	0.39	0 00	1.00
Time Since End of Adjacent State Prohibition	14.47	15.31	0.00	61.00
Age At End of Adjacent State Prohibition	6.55	11.74	0.00	83.00
Left Censored	0.03	0.17	0.00	1.00
State Density at Birth	110.30	98.84	1.00	383.00
Age	17.59	16.26	0.00	132.00

TABLE 2

Effects of Prohibition on the State-level Foundings of US Breweries: 1845-1918[a]

	1	2	3	4	Rural 5	Large City 6	Very Large City 7
Constant	-2.046 *	-2.217 *	-2.183 *	-2.186 *	1.965 *	.860	.749
	(.7532)	(.7792)	(.7389)	(.7487)	(.7175)	(1.2274)	(1.3119)
# of Nonlocal Prohibitions	.022 *	.109 *	.107 *	.103 *	.106 *	.003	.045
	(.0074)	(.0176)	(.0186)	(.0186)	(.0212)	(.0709)	(.0835)
(# of Nonlocal Prohibitions)^2		- .007 *	- .007 *	- .007 *	- .007 *	- .002	- .008
		(.0014)	(.0014)	(.0014)	(.0017)	(.0034)	(.0066)
# of Adjacent States with Prohibition			.060 *	.274 *	.263 *	1.356 *	.684 *
			(.0252)	(.0575)	(.0631)	(.4592)	.2705
(# of Adjacent States with Prohibition)^2				- .089 *	- .108 *	- .429 *	- .209 *
				(.0218)	(.0252)	(.1752)	(.0794)
Year after 1912 (Webb-Kenyon Act)	-1.557 *	- .99 *	- .994 *	- .987 *	-1.158 *	- .584	- .613
(1=Yes; 0=No)	(.1610)	(.1653)	(.1663)	(.1672)	(.2007)	(.5413)	.5290
End of Prohibition	2.871 *	2.806 *	2.775 *	2.783 *	2.796 *	3.093 *	3.596 *
	(.0713)	(.0721)	(.0733)	(.0736)	(.0777)	(.5884)	.4830
State Brewery Density	.002 *	.001	.001	.001	.0001	.003	.015 *
	(.0009)	(.0009)	(.0009)	(.0009)	(.0009)	(.0088)	(.0049)
(State Brewery Density)^2	- .0001 *	- .0001 *	- .0001 *	- .0001 *	- .0001 *	- .0001	- .0002
	(.00002)	(.00002)	(.00002)	(.00002)	(.00002)	(.00024)	(.00011)
# of Foundings in each State[b]	.005 *	.005 *	.005 *	.005 *	.007 *	.061 *	.013 *
	(.0006)	(.0006)	(.0006)	(.0006)	(.0008)	(.0296)	(.0053)
# of Deaths in each State	- .007 *	- .006 *	- .006 *	- .005 *	- .004 *	- .027	- .014 *
	(.0010)	(.0010)	(.0010)	(.0010)	(.0010)	(.0151)	(.0048)
State Population	.00016 *	.00017 *	.00018 *	.00017 *	.00027 *	.00022	- .0001
	(.00003)	(.00003)	(.00003)	(.00003)	(.00004)	(.00038)	(.00015)
Adjacent State Brewery Density	.0008 *	.0007 *	.0008 *	.0011 *	.0013 *	-.00045	-.00004
	(.0002)	(.0002)	(.0002)	(.0002)	(.0003)	(.0014)	(.0012)
Adjacent State Population	-.00020 *	-.00020 *	-.00020 *	-.00020 *	-.00024 *	-.00001	-.00019
	(.00001)	(.00001)	(.00001)	(.00001)	(.00002)	(.00006)	(.00011)
# of Adjacent States	.473 *	.472 *	.458 *	.457 *	.389 *	- .066	.29
	(.1640)	(.1677)	(.1607)	(.1619)	(.1507)	(.2106)	(.2644)
Non-adjacent State Density	.00083 *	.00086 *	.00084 *	.00079 *	.00081 *	.00005	-.00066
	(.00005)	(.00005)	(.00005)	(.00005)	(.00006)	(.00034)	(.00053)
Founded in 1874	3.103 *	3.07 *	3.073 *	3.052 *	3.185 *	1.007 *	2.144 *
	(.0336)	(.0344)	(.0345)	(.0348)	(.0368)	(.3311)	(.1579)
Industry Age	.002	-.00028	- .001	- .001	- .001	- .036 *	- .007
	(.0024)	(.0024)	(.0024)	(.0024)	(.0026)	(.0224)	(.0193)
ϕ^c	.449 *	.442	.453 *	.465 *	.487 *	3.745	3.681
	(.0797)	(.0766)	(.0777)	(.0843)	(.0904)	5.6934	(2.8426)
Function Value	6465.14	6481.38	6484.18	6492.64	4615.17	-223.32	444.52
Number of Cases	3225	3225	3225	3225	3225	383	262
Number of Foundings	6255	6255	6255	6255	5352	261	642

[a] Standard errors are in parentheses.

[b] In models 5, 6, and 7 this variable measures rural, large city, and very large city foundings in each state respectively.

[b] $1/\phi$ is an estimate of the variance of the gamma-distributed cluster-specific random effect in the negative multinomial model.

* p<.05

TABLE 3

Effects of Prohibition on Organizational Mortality among US Breweries: 1845-1918[a]

	1	2	3	4	5	6	7
Constant	-3.989 *	-3.962 *	-3.923 *	-3.93 *	-3.91 *	-4.099 *	-3.993 *
	(.0981)	(.0993)	(.1000)	(.1001)	(.1003)	(.1068)	(.1042)
# of Nonlocal Prohibitions	.065 *	.065 *	.065 *	.065 *	.064 *	.059 *	.057 *
	(.0053)	(.0053)	(.0053)	(.0053)	(.0054)	(.0055)	(.0055)
# of Adjacent States with Prohibition		-.031	-.136 *	-.138 *	-.101 *	-.216 *	-.213 *
		(.0188)	(.0385)	(.0385)	(.0399)	(.0535)	(.0535)
(# of Adjacent States with Prohibition)^2			.038 *	.037 *	.04 *	.058 *	.063 *
			(.0119)	(.0119)	(.0121)	(.0133)	(.0134)
Large City (250,000-500,000) (1=Yes; 0=No)				.093	.145 *	.153 *	.163 *
				(.0573)	(.0652)	(.0654)	(.0654)
Very Large City (Greater than 500,000) (1=Yes; 0=No)				.131 *	.302 *	.296 *	.299 *
				(.0463)	(.0560)	(.0561)	(.0562)
Large City Brewery X # of Adjacent States with Prohibitions					-.098	-.102	-.103
					(.0610)	(.0610)	(.0610)
Very Large City X # of Adjacent States with Prohibitions					-.243 *	-.246 *	-.245 *
					(.0491)	(.0492)	(.0492)
Change in Adjacent State Prohibition Status						.322 *	.231 *
						(.0815)	(.0799)
Log Time since Change in Adjacent State Prohibition Status						-.148 *	-.111 *
						(.0182)	(.0164)
Log Age at Time of Change in Adjacent State Prohibition Status						-.096 *	
						(.0172)	
# of Adjacent State Prohibition Changes Experienced							-.035 *
							(.0115)
Year after 1912 (Webb-Kenyon Act) (1=Yes; 0=No)	-.016	.008	-.002	.004	.004	-.017	-.047
	(.0864)	(.0871)	(.0874)	(.0875)	(.0875)	(.0878)	(.0881)
Beginning of Prohibition	3.193 *	3.209 *	3.209 *	3.217 *	3.219 *	3.231 *	3.22 *
	(.0495)	(.0504)	(.0503)	(.0505)	(.0506)	(.0506)	(.0511)
State Brewery Density	-.003 *	-.003 *	-.004 *	-.003 *	-.003 *	-.003 *	-.003 *
	(.0006)	(.0006)	(.0006)	(.0006)	(.0006)	(.0006)	(.0006)
(State Brewery Density)^2	.0001 *	.0001 *	.0001 *	.0001 *	.0001 *	.0001 *	.0001 *
	(.00001)	(.00001)	(.00001)	(.00002)	(.00002)	(.00002)	(.00002)
State Brewery Density at Birth	.003 *	.003 *	.003 *	.003 *	.003 *	.002 *	.003 *
	(.0003)	(.0003)	(.0003)	(.0003)	(.0003)	(.0003)	(.0003)
# of Foundings in each State	.001 *	.001 *	.001 *	.001 *	.001 *	.001 *	.001 *
	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)
# of Deaths in each State	-.037 *	-.037 *	-.037 *	-.037 *	-.038 *	-.038 *	-.038 *
	(.0025)	(.0025)	(.0025)	(.0025)	(.0025)	(.0025)	(.0025)
State Population	-.00003	-.00002	-.00002	-.00003	-.00003	-.00001	-.00002
	(.00001)	(.00001)	(.00001)	(.00001)	(.00001)	(.00001)	(.00001)
Adjacent State Brewery Density	.0005 *	.0005 *	.0004 *	.0004 *	.0004 *	.0006 *	.0006 *
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0002)	(.0002)
Adjacent State Population	-.00004 *	-.00004 *	-.00004 *	-.00004 *	-.00004 *	-.00004 *	-.00004 *
	(.00001)	(.00001)	(.00001)	(.00001)	(.00001)	(.00001)	(.00001)
# of Adjacent States	.136 *	.138 *	.135 *	.134 *	.129 *	.137 *	.138 *
	(.0126)	(.0127)	(.0127)	(.0127)	(.0128)	(.0130)	(.0130)
Non-adjacent State Density	.00043 *	.00043 *	.00043 *	.00043 *	.00046 *	.00041 *	.00040 *
	(.00004)	(.00004)	(.00004)	(.00004)	(.00004)	(.00004)	(.00004)
Founded in 1874	.135 *	.133 *	.13 *	.141 *	.147 *	.153 *	.145 *
	(.0378)	(.0378)	(.0378)	(.0380)	(.0380)	(.0383)	(.0382)
Left-Censored in 1844	.646 *	.636 *	.632 *	.627 *	.619 *	.681 *	.611 *
	(.1100)	(.1102)	(.1102)	(.1103)	(.1105)	(.1129)	(.1117)
Industry Age	.011 *	.011 *	.011 *	.011 *	.01 *	.013 *	.012 *
	(.0016)	(.0016)	(.0016)	(.0016)	(.0016)	(.0017)	(.0017)
Log(Organizational Age)	-.409 *	-.409 *	-.408 *	-.41 *	-.41 *	-.37 *	-.396 *
	(.0125)	(.0125)	(.0125)	(.0125)	(.0125)	(.0144)	(.0133)
Likelihood Chi-Squared Ratio	6300.26	6303.04	6312.59	6322.25	6349.77	6426.77	6404.47
Degrees of Freedom	17	18	19	21	23	26	26
Number of Firm-Year Spells	100136	100136	100136	100136	100136	100136	100136
Number of Events	5507	5507	5507	5507	5507	5507	5507

[a] Standard errors are in parentheses.

* $p<.05$

TABLE 3 (Continued)

Effects of Prohibition on Organizational Mortality among US Breweries: 1845-1918[a]

	8	9
Constant	-4.014 * (.1071)	-4.045 * (.1050)
# of Nonlocal Prohibitions	.057 * (.0056)	.065 * (.0054)
# of Adjacent States with Prohibition	- .192 * (.0557)	- .091 * (.0447)
(# of Adjacent States with Prohibition)^2	.053 * (.0135)	.032 * (.0130)
Large City (250,000-500,000) (1=Yes; 0=No)	.153 * (.0654)	.146 * (.0654)
Very Large City (Greater than 500,000) (1=Yes; 0=No)	.291 * (.0562)	.308 * (.0562)
Large City Brewery X # of Adjacent States with Prohibitions	- .101 (.0613)	- .109 (.0615)
Very Large City X # of Adjacent States with Prohibitions	- .241 * (.0492)	- .248 * (.0493)
Start of Adjacent State Prohibition	.309 * (.0969)	
Log Time since Start of Adjacent State Prohibition	- .131 * (.0219)	
Log Age at Start of Adjacent State Prohibition	- .053 * (.0183)	
End of Adjacent State Prohibition		.098 (.0723)
Log Time since End of Adjacent State Prohibition		- .083 * (.0186)
Log Age at End of Adjacent State Prohibition		- .075 * (.0169)
Year after 1912 (Webb-Kenyon Act) (1=Yes; 0=No)	- .032 (.0880)	- .002 (.0875)
Beginning of Prohibition	3.201 * (.0507)	3.213 * (.0518)
State Brewery Density	- .003 * (.0006)	- .003 * (.0006)
(State Brewery Density)^2	.0001 * (.00002)	.0001 * (.00002)
State Brewery Density at Birth	.003 * (.0003)	.002 * (.0003)
# of Foundings in each State	.002 * (.0005)	.001 * (.0005)
# of Deaths in each State	- .038 * (.0025)	- .038 * (.0025)
State Population	- .00001 (.00002)	- .00003 (.00002)
# of Adjacent States	.13 * (.0130)	.136 * (.0130)
Adjacent State Population	(.00003) * (.00001)	(.00003) * (.00001)
Adjacent State Brewery Density	.0006 * (.0002)	.0006 * (.0002)
Non-Adjacent State Density	.00042 * (.00004)	.00043 * (.00004)
Founded in 1874	.152 * (.0382)	.152 * (.0382)
Left-Censored in 1844	.657 * (.1145)	.651 * (.1124)
Industry Age	.012 * (.0017)	.011 * (.0016)
Log(Organizational Age)	- .394 * (.0135)	- .385 * (.0137)
Likelihood Chi-Squared Ratio	6393.67	6386.43
Degrees of Freedom	26	26
Number of Firm-Year Spells	100136	100136
Number of Events	5507	5507

[a] Standard errors are in parentheses

* p<.05