Strategic Management Journal, Vol. 19, 389–404 (1998)

ENTRY INTO NEW MARKET SEGMENTS IN MATURE INDUSTRIES: ENDOGENOUS AND EXOGENOUS SEGMENTATION IN THE U.S. BREWING INDUSTRY

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I evaluate two processes, niche formation and resource-partitioning, that could independently account for the entry of firms into new market segments in mature industries. The niche formation argument focuses on environmental changes that promote the entry of new firms whereas the research-partitioning argument is based on the internal differentiation of a mature industry into subgroups composed of specialist and generalists. In other words, the niche formation and resource-partitioning accounts emphasize forces that are exogenous and endogenous to the industry, respectively. I attempt to resolve this theoretical tension by modeling the effects of niche formation and resource-partitioning together on the founding of firms in the microbrewery and brewpub segments of the U.S. brewing industry. I find that niche formation provides a better explanation for both microbrewery and brewpub foundings. In addition, I find limited evidence that the process of resource-partitioning is being played out again within the microbrewery segment of the industry. Implications for the evolution of organizational heterogeneity within industries are discussed. © 1998 John Wiley & Sons, Ltd.

Strat. Mgmt. J., Vol. 19, 389–404, 1998

Historical records of several organizational populations show that most organizations within them were founded in brief periods (Stinchombe, 1965; Aldrich, 1979: 177). Stinchcombe (1965: 154) notes that 'an examination of the history of almost any type of organization shows that there are great spurts of foundation of organizations of the type, followed by relatively slower growth, perhaps to be followed by *new spurts*, generally of a *fundamentally different kind of organization* in the same field.' Sociologists explain this punctuated pattern in foundings in terms of factors affecting the distribution of resources in the environment. These include the changing role of the state, the development of a market-oriented economy, increasing levels of urbanization, greater literacy because of better schooling, and political revolution. Traditionally, this stream of research has attempted to identify exogenous factors that affect the emergence of entirely new organizational populations.

This study departs from the traditional approach by examining processes that drive a new spurt in foundings within an existing population of business organizations, in other words a mature industry. Industry maturity is often synonymous with a few dominant firms, high entry barriers and a low rate of entry. However, mature industries often show a dramatic increase in the number of firms. Typically this occurs as a result of the founding of new kinds of organizations that are different from incumbent firms. In the parlance of Hannan and Freeman (1989), these new entrants represent new organizational forms —their formal structure, patterns of activity, and normative order are different from those of incumbent firms. It is important to develop an

Key words: organizational founding, market entry, organizational ecology, entrepreneurship, specialist strategies

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CCC 0143–2095/98/040389–16 $17.50

understanding of firm entry into new market segments of mature industries due to the prominent role of entrants in the renewal and growth of such industries (Abernathy and Clark, 1985).

In this paper I examine two alternative explanations for firm entry into new market segments in mature industries: niche formation and resource-partitioning. The niche formation and resource-partitioning arguments differ in the extent to which they assume that the entry of firms into new market segments in a mature industry is driven by forces that are exogenous or endogenous to the industry. The niche formation argument emphasizes forces that are largely exogenous to the industry (Delacroix and Solt, 1988). New market niches emerge as a result of discontinuities in an industry's environment. These discontinuities may reflect changes in technology or consumer behavior (Tushman and Anderson, 1986; Delacroix and Solt, 1988). In either case, potential entrepreneurs recognize the opportunities afforded by the formation of the new niche and enter the industry.

The alternative explanation for the entry of firms into new market segments in a mature industry relies on a process of resource-partitioning (Carroll, 1985). According to the resource-partitioning model, as industries mature they come to be dominated by a few generalist firms. These generalist firms attempt to maximize their performance by drawing on the largest possible resource space, the center of the market. This opens up pockets of resources on the periphery of the market. Entrepreneurs then found specialist firms to exploit these peripheral resources. This process generates outcomes that are consistent with the observation of competitive fringes in many industries (Beesley and Hamilton, 1984). Thus the resource-partitioning model lays greater emphasis on changes endogenous to the generalist segment of industries. Movement towards the center by generalists leads to resource-partitioning which in turn creates conditions that facilitate the entry of specialist firms.

The two explanations also imply varying degrees of managerial initiative in the founding of new specialist firms. The niche formation argument attaches a great deal of importance to the ability of potential entrepreneurs to respond to the emergence of a new niche. The resource-partitioning model, however, assumes that adaptation constraints (Hannan and Freeman, 1984) prevent incumbent firms from moving into the specialist niche. Instead, this space is likely to be filled by new firms that thrive on the periphery, in part because they avoid competing with the dominant generalist firms. The niche formation and resource-partitioning hypotheses are tested using life-history data on the population of U.S. breweries in the period 1939–95.

The next section consists of a brief overview of trends in the post-Prohibition American brewing industry. I then discuss the niche formation and resource-partitioning models as they apply to the entry of firms into new market segments in mature industries. After this, I describe the data and the methods to be used in testing the hypotheses. Finally, I present the findings and discuss their implications for the evolution of organizational heterogeneity within industries.

THE U.S. BEER BREWING INDUSTRY: 1933–95

The legality of the American industries producing alcoholic beverages has been subject to question throughout history. Several states have imposed Prohibition at one time or another, the earliest being Maine in 1846. In 1919, 36 states ratified the 18th Amendment to enact national Prohibition. This ban lasted until 1933, when it was repealed. Most of the breweries founded immediately after Prohibition operated before Prohibition: 617 out of the 842 breweries founded in 1933–34 were 'restarts.' New firm foundings are also high in these 2 years (53 in 1933 and 172 in 1934). Both restarts and new firm foundings fell to an insignificant number after 1950.

The number of breweries declined from a maximum of 933 in 1934 to a minimum of 43 in 1981 and 1983. The decline in the number of firms reflects not only brewery failures, but also the greater incidence of mergers and acquisitions (Tremblay and Tremblay, 1988). Since the repeal of Prohibition, and particularly in the post-World War II period, the American brewing industry has undergone rapid concentration. The industry four-firm concentration ratio has risen from 11 percent in 1935 to 78 percent in 1982 (U.S. Bureau of the Census, 1982) to 89.7 percent by 1995 (Modern Brewery Age, 1996). Most observers consider this trend as evidence demonstrating the operation of economies of scale in

the industry (Scherer, 1980; Elzinga, 1986). While the number of firms fell from 710 in 1935 to 43 in 1983, the total production of the industry increased from 42 to 178 million barrels over the same period. Thus the decline in the number of firms does not represent unfavorable conditions for the industry, but rather the increasing domination of the industry by a few large generalist firms (Keithahn, 1978).

The American brewing industry witnessed a spurt of new foundings beginning in the late 1970s. This recent burst of foundings has been driven by the emergence of organizational forms that are new in the post-Prohibition era—the microbrewery and the brewpub (Institute for [Fermentation and] Brewing Studies, various years; Carroll and Swaminathan, 1992). Both microbreweries and brewpubs produce ale and beer by traditional processes. Microbrewery products are available through regular distribution channels, whereas brewpub products are available only at the site of production. The first microbrewery is recognized to be the New Albion Brewery of Sonoma, California founded in 1977. The brewpub is even more recent, the first one being the Mendocino Brewing Company of Hopland, California founded in 1983. At last count (January 1996), the number of brewpubs (516) and microbreweries (287) far exceeded the number of generalist mass producers (24) in the brewing industry.

Carroll and Swaminathan (1992) argue that mass producers, microbreweries, and brewpubs constitute separate organizational forms to the extent that they encounter very different environments and respond differently to those distinct environments. An examination of common strategies followed by these organizational forms suggests strong mobility barriers across these three strategic groups (Caves and Porter, 1977; Mascarenhas and Aaker, 1989). The mass producer segment of the industry is characterized by strong economies of scale in production and advertising and extensive distribution networks. The microbrewers, by contrast, target their products for small upscale niches in the market and, at least initially, are geographically localized. Development of such markets is sometimes achieved by promotional efforts but is often accomplished through word of mouth. The cultivation of elite networks is thus crucial to the performance and survival of microbreweries. Gaining and maintaining regular access to such consumers can be problematic, especially given the dominance of distribution networks by the mass producers. Finally, it is not clear that brewpubs compete with the two other forms so much as they do against local drinking and dining establishments. Potential returns on investments can be quite high, however, since the packaging and distribution costs faced by other brewers are avoided by this form.

In keeping with their localized specialist strategies, the microbreweries and brewpubs are much smaller in size. For the period 1939–95, the average annual production capacity of firms ranged from 1391 barrels for brewpubs to 9871 barrels for microbreweries to 930,517 barrels for mass producers. A specialist strategy is not the only factor differentiating microbreweries and brewpubs from mass producers. They differ also in their formal structures. In accordance with their smaller size they have fewer employees. More importantly, however, entrepreneurs who start up microbreweries or brewpubs often require technical and brewing skills in addition to their business acumen (Mares, 1991: 139). Mass producers may be family-run enterprises, but they usually hire technical staff for daily operations. The normative order among microbreweries and brewpubs is also considerably different. Cooperation and not competition seems to be the norm in mutual interaction. For example, it is common for microbreweries and brewpubs in the same area to negotiate shared bulk purchasing agreements with suppliers of raw materials, to share distribution channels and to jointly fund promotional activities. In the next section, I develop hypotheses that explain the entry of microbreweries and brewpubs into the brewing industry in terms of niche formation and resource-partitioning processes.

THEORY AND HYPOTHESES

Niche formation

Delacroix and Solt (1988: 54) argue that foundings in the California wine industry are driven by a niche formation process. They write:

> A new niche may become available for a given type of organization with the advent of new technologies to perform old tasks, with the opening of new environmental resources hitherto not

> accessible for tapping, or the emergence of new ways to obtain resources from the environment on the basis of unchanged technology.

According to Delacroix and Solt (1988), the latter process of niche formation has been responsible for the recent surge in winery foundings. In their view, the new niche in the wine industry evolved out of changes in lifestyle and associated consumer preferences. A change in consumer preferences is one among several exogenous factors that may lead to the creation of a new niche. A new niche could also be formed as a result of technological discontinuities. For example, foundings in the semiconductor manufacturing industry seem to be driven by technological innovation (Brittain and Freeman, 1980). Tushman and Anderson (1986) account for product substitution through technological changes which destroy the competencies of incumbent firms. The emergence of new product classes such as cement (in 1872), airlines (in 1924), and plain-paper copying (in 1959) is attributed to basic technological innovations. Innovation in production technology does not seem to be a major force behind the entry of firms into new market segments in the brewing industry. In fact, in brewing the technology employed by both microbreweries and brewpubs is primitive by industry standards—it closely resembles the technology in use over a century ago.

Abernathy and Clark (1985: 18) suggest that three specific kinds of environmental changes might lead to the formation of a new niche. First, new technological options offer improved performance or new applications that cannot be met by existing product designs. Second, changes in government policy, especially in regulatory regimes, may favor revolutionary strategic development. Finally, changes in consumer preferences may impose requirements that can be met only through new design approaches. Delacroix and Solt's (1988) niche formation argument thus has the same flavor as the process of 'niche creation innovation' (Abernathy and Clark, 1985: 10–11) where organizations build on existing technical competence and apply it to emerging market segments. Given an underlying change in consumer preferences, the influx of firms into a new market segment or niche in a mature industry is likely to be greater as the new market niche expands in volume.

> *Proposition 1: The greater the volume of a new market niche in a mature industry, the higher the founding rate of firms in that niche.*

Delacroix and Solt (1988) use the level of wine imports as an indicator of the volume of a new niche comprising the table and sparkling wine segments. Increases in the level of wine imports have a strong positive effect on foundings in the California wine industry. Delacroix and Solt (1988) interpret this as evidence that niche formation increases the founding rate. It is even more true in the case of brewing that imported products come closest to resembling microbrewery and brewpub products. Although Delacroix and Solt's (1988) analysis is not able to identify the organizational form of entrants into new niches in the wine industry, in the brewing industry it is clear that new niches are being occupied by organizations with new forms (Carroll and Swaminathan, 1992). The niche formation argument would suggest the following hypothesis:

> *Hypothesis 1: The greater the volume of beer imports, the higher the founding rate of microbreweries and brewpubs.*

Resource-partitioning

Trends in organizational density—the number of organizations in an industry—are often related to trends in industrial concentration. As the number of organizations declines, the market share held by the largest few firms typically increases. Carroll (1985) developed a model of resource-partitioning to account for the mortality rates of specialist firms in environments characterized by varying degrees of industrial concentration. By definition, generalists depend on a wide range of environmental resources for survival, whereas specialists survive only within a narrow range of environmental resources.

The level of industrial concentration has implications for the dispersion of resources within a market. When the market is characterized by low concentration levels it approximates the economists' conception of a perfect, atomistic market. That is, the market is composed of a large number of generalist firms, each of which cannot individually affect prevalent price levels. Firms tailor their products or services to appeal to a slightly different set of consumers. In terms of market

coverage, there is a certain degree of overlap near the center, but the differentiated appeals developed by individual firms ensures that each generalist firm possesses a unique advantage in certain market segments. The existence of these partially intersecting strategies implies that a larger proportion of the total market is covered. The resource space available for specialists is smaller—there are fewer market segments left to exploit.

As the level of concentration in the market rises, the death rate of generalist firms increases as they compete with each other to gain control over the center of the market. The surviving generalist firms that come to dominate the market are fewer in number and larger in size. The degree of overlap in generalist firm strategies is higher since most of them try to exploit resources available at the market center. The total resource space covered by generalist firms is smaller than in the case of a competitive, unconcentrated market where they offer differentiated products or services. Therefore in the concentrated market specialist firms have access to greater resources. They can exploit peripheral market segments without entering into direct competition with the larger generalists. Greater resource availability should improve the survival chances of such specialist firms as the market concentrates. At this point, the total market is partitioned into generalized and specialized segments. In a concentrated market generalist and specialist firms seem to operate in distinct resource spaces whereas they relied on a common resource base in an unconcentrated market.

The resource-partitioning model can easily be extended to the founding process (Freeman and Lomi, 1994; Lomi, 1995; Swaminathan, 1995). High concentration in the market implies that specialists can draw upon peripheral resources without entering into direct competition with generalists. Increasing levels of market concentration free more peripheral resources. Existing specialists may grow and survive longer by exploiting such resources. The increased availability of peripheral resources may also facilitate the founding of specialist organizations. Therefore

> *Proposition 2: The greater the degree of resource-partitioning within an industry, the higher the founding rate of specialists.*

In the brewing industry, generalists are represented by mass producers. New organizational forms—microbreweries and brewpubs—are specialists.

> *Hypothesis 2: The greater the degree of market concentration in the brewing industry, the higher the founding rate of microbreweries and brewpubs.*

The niche formation and resource-partitioning hypotheses need to be tested with reference to a baseline model of organizational founding among microbreweries and brewpubs. In particular, this baseline model ought to address three important influences on the founding rate of firms in new market segments within a mature industry: the carrying capacity of the environment, density-dependent evolution, and institutional support. Below I sketch a baseline model of microbrewery and brewpub founding that takes these influences into account.

Carrying capacity

Organizational founding rates are likely to be higher when the excess carrying capacity of the environment is greater (Brittain and Freeman, 1980; Pennings, 1982; Baum and Singh, 1994). The carrying capacity of the environment for microbreweries and brewpubs is likely to vary across states. I model these state-level differences in terms of three variables: the per capita personal income of a state's residents, the per capita beer consumption of a state's residents, and the percentage of a state's population that lives in dry areas. Although there is very little cross-ownership of firms in the wine and brewing industries, it is intriguing that new organizational forms in brewing emerged shortly after equivalent forms had emerged in the wine industry. It is appealing to argue that developments in both populations reflect a common underlying process—a change in lifestyle and consumer demand for greater variety. These developments are associated with the emergence of small upscale niches comprising relatively affluent consumers. Therefore states with higher per capita incomes are likely to experience a higher entry rate of microbreweries and brewpubs. On the other hand, states that have a large proportion of their populations living in dry areas likely reflect persistent social norms that discourage the sale and consumption of alcoholic beverages. In such states, microbrewery and brewpub foundings are likely to be lower.

Density-dependent evolution

According to a model of density-dependent organizational evolution proposed by Hannan (1986), the founding rate within an organizational population increases when an organizational form reaches higher levels of legitimacy and decreases with increasing competition within the population (see also Hannan and Carroll, 1992). The number of organizations (or density) corresponds to the processes of legitimation and competition. At low levels of density, each addition to the population facilitates the legitimation process and therefore increases founding rates. As density increases and approaches the environmental carrying capacity, competitive processes set in and the effect of density is reversed and it lowers the founding rate. Thus, this model predicts that density dependence in rates of founding is nonmonotonic.

Although the competitive effects of density are intuitive, the positive effect of initial increases in density on the organizational founding rate is subject to interpretations other than the social legitimation of the organizational form (Delacroix and Rao, 1994). In particular, the legitimating effects of density on the founding rate of organizations with new forms can also be interpreted as a case of learning at the population level (Miner and Haunschild, 1995). Small businesses are more likely to succeed if they are founded by entrepreneurs who have failed at earlier attempts (Mayer and Goldstein, 1961: 138–139). Stinchcombe (1965: 152) notes that 'the level of organizational experience of a population is a main determinant of their capacity to form new organizations.' I would argue that the acquisition of learning and legitimacy through a proliferation in numbers of a new organizational form are complementary processes since they both occur at the population level. In fact, these processes may act in ways that reinforce each other.

The density-dependent model of organizational evolution has been validated in several organizational populations, including an earlier analysis of microbrewery and brewpub foundings (Carroll and Swaminathan, 1992). If microbreweries and brewpubs are new organizational forms, then the density model should apply to them separately. Carroll and Swaminathan's (1992) analysis of microbrewery and brewpub founding rates over 1975–89 supports this view. Their results show that microbreweries and brewpubs are subject to separate processes of legitimation and competition based on form-specific counts of density at the national level. The treatment of density-dependent effects in this study improves upon Carroll and Swaminathan's (1992) analysis in significant ways. First, in keeping with the localized strategies of microbreweries and brewpubs, I model form-specific density dependence in foundings of these new organizational forms at the state level. Second, I model interdependence between mass producers, microbreweries, and brewpubs in a differentiated manner. Microbreweries and brewpubs in the same state are expected to exhibit a mutualistic relationship. Although they produce similar products, they do not compete directly since brewpub products are consumed on their premises whereas microbrewery products have to reach consumers through regular distribution channels. Unlike microbreweries and brewpubs, the impact of generalist mass production breweries is likely to be felt nationwide. Mass producers are likely to exert a competitive effect on microbreweries since their products are designed for at-home consumption and distributed through the same channels. The modeling choices described above are consistent with Hannan and Carroll's (1992: 208–209) recommendation that the level of analysis chosen to model density-dependent effects ought to capture most of the competition occurring among similar organizations (see also Singh, 1993; Budros, 1994).

Institutional support

A supportive institutional environment is likely to foster higher organizational founding rates. Institutional support is often provided in the form of government regulations that protect infant or endangered organizations (Carroll, Delacroix, and Goodstein, 1988), laws that structure industry competition in particular ways (Barnett and Carroll, 1993), or financial incentives that encourage entrepreneurial activity (Tucker, Singh, and Meinhard, 1990). Tucker *et al*. (1990) found that the establishment of the 'Opportunities for Youth' program between 1971 and 1975 legitimated and provided additional resources for voluntary social service organizations (VSSOs) in Canada. Consequently, specialist VSSOs were founded at a much higher rate during this period. Budros (1992) found that the passage of New York's Insurance Incorporation Act stimulated the found-

ing of insurance carriers in the state. Similarly, in the brewing industry the legalization of brewpubs by individual states might signify a more supportive institutional environment for new organizational forms in the brewing industry. By definition, brewpubs could not be founded before they became legal. A more intriguing possibility is that microbreweries were founded at higher rates in states that legalized brewpubs.

DATA AND METHODS

Data

Bull, Friedrich, and Gottschalk's (1984) *American Breweries* constitutes the primary source of event-history data for the population of brewing firms. This data source includes information on all American beer producers except those who produce under contract to others. The data have been verified using annual lists of brewing firms published in the *Modern Brewery Age Bluebooks* (Modern Brewery Age, various years) and the *Brewers Almanac* (U.S. Brewers Association, various years) which uses the Department of Alcohol, Tobacco and Firearms as its primary source. The historical coverage has been extended to 1995 by including information gathered from Tremblay and Tremblay (1988) and the *Microbrewery Resource Handbooks* (Institute for [Fermentation and] Brewing Studies, various years). From the event-history data, I calculated counts of density, foundings, and deaths in any given year. Four-firm concentration ratios were calculated as the combined market share of the four largest firms. These estimates are based on sales data reported in the *Modern Brewery Age Bluebooks* and the *Microbrewery Resource Handbooks*. Data on beer imports have been obtained from the *Brewers Almanac*. Data on the total production of microbreweries and brewpubs have been derived by aggregating individual firm production figures which are available in the *Modern Brewery Age Bluebooks* and the *Microbrewery Resource Handbooks*. Descriptive statistics for the variables used in the analyses are given in Tables 1 and 2.

Since microbreweries are at risk of founding in all states during the entire observation period, the analysis of microbrewery founding rates covers 51 states (including the District of Columbia) over a 57-year period (1939–95). Data on per capita income and state population are not available for Alaska and Hawaii for a total of 42 state-years. Therefore the analysis includes 2865 (51 states $\times$ 57 years -42) state-year spells. Brewpubs are at risk of founding only after the organizational form is legalized in a given state. California and Washington were the first states to legalize the form in 1982. Given that brewpubs are such a recent phenomenon, the analysis of brewpub founding rates includes only 305 state-year spells.

Methods

In modeling the organizational founding process, I follow convention in defining the population as the unit of analysis and treat foundings as events in a point process (Cox and Isham, 1980; Amburgey and Carroll, 1984; Amburgey, 1986). Because the dates of founding often record only the year of founding, I do not know the ordering of events within years. Nor do I know the exact duration between foundings. In doing work of this kind, organizational ecologists have typically assumed a constant rate of founding with log-linear dependence on covariates (Hannan and Freeman, 1989). This approach assumes that, conditional on the values of the covariates, a time series of annual counts of foundings is the realization of a Poisson process. This implies that the number of foundings in year t, Y_t, is determined by the probability law:

$$\Pr(Y_t = y_t) = \exp(-\lambda_t)\ \lambda_t^{y}\mathrm{t}/\mathrm{y}_t! \qquad (1)$$

The relationship between the founding rate, λ_t, and the vector of covariates, $\mathbf{x}_t$, is specified as follows:

$$\ln \lambda_t = \alpha + \beta \mathbf{x}_t \qquad (2)$$

Some implications of the Poisson model are that the expected number of events in a given year t is equal to the mean founding rate, λ_t, and that the variance of the number of events equals λ_t. Poisson regression methods typically estimate the regression parameters by using the Poisson probability law in Equation 1 to form likelihoods for the data and then employ methods for maximum likelihood estimation. This approach has important advantages over methods based on conventional regression analysis of time series

Table 1. Descriptive statistics for variables used in the analysis of microbrewery foundings[a]

Variable	Mean	S.D.	Minimum	Maximum
Number of state-level microbrewery foundings	0.117	0.680	0	19
State microbrewery density	0.319	1.479	0	29
Out-of-state microbrewery density	15.969	36.227	0	192
State brewpub density	0.476	3.268	0	76
National mass producer density	182.631	173.236	23	641
Industry concentration (4-firm ratio as a percentage)	46.945	25.274	13.5	90.0
Volume of imports (millions of gallons)	2.630	3.372	0.031	10.489
Brewpub legality (1 = legal; 0 = illegal)	0.107	0.309	0	1
Brewpub legality × state microbrewery density	0.259	1.436	0	29
State per capita annual personal income (thousands of constant 1987 dollars)	10.487	3.876	1.817	25.246
State per capita annual beer consumption (gallons)	18.275	6.682	1.6	40.4
% of state population living in dry areas	5.99	12.33	0	63.11

[a]N = 2865 for all variables

Table 2. Descriptive statistics for variables used in the analysis of brewpub foundings[a]

Variable	Mean	S.D.	Minimum	Maximum
Number of state-level brewpub foundings	1.928	3.312	0	26
State brewpub density	4.416	9.116	0	76
Out-of-state brewpub density	173.328	106.324	0	352
State microbrewery density	2.436	3.756	0	29
National mass producer density	25.007	2.243	23	33
Industry concentration (4-firm ratio as a percentage)	87.310	2.450	75.9	90.0
Volume of imports (millions of gallons)	8.954	0.884	5.754	10.489
State per capita annual personal income (thousands of constant 1987 dollars)	16.152	2.504	11.63	25.246
State per capita annual beer consumption (gallons)	23.447	3.822	12.7	37.7
% of state population living in dry areas	4.055	9.787	0	46.35

[a]N = 305 for all variables

data on foundings. Most importantly, OLS or GLS regression methods used in early studies of organizational foundings (see, for example, Delacroix and Carroll, 1983) do not take into account the non-negativity of event counts or the discontinuous nature of count data.

However, assuming that a series of counts of foundings is a realization of a Poisson process means assuming that the occurrence of an event is independent of previous events. It also means assuming that the expected number of foundings in a year equals the variance of the number of foundings in that year. Both these assumptions are problematic in the analysis of founding rates, where the variance of event counts often exceeds the mean, a condition called 'overdispersion'. Either unobserved heterogeneity in founding rates or positive 'contagion' can generate overdisper-

sion. In this case, contagion means that the occurrence of an event affects the rate of subsequent occurrence. There is reason to believe that both sources of overdispersion are evident in the organizational founding process. Adopting the Poisson model in such a situation can lead to misleadingly small standard errors for the estimated coefficients (Hausman, Hall, and Griliches, 1984). Instead, I use the negative binomial model which overcomes this limitation of the Poisson model through the inclusion of an overdispersion parameter (Cameron and Trivedi, 1986; Ranger-Moore, Banaszak-Holl, and Hannan, 1991; Barron, 1992). That is, the relationship between the founding rate, λ_t, and the vector of covariates, $\mathbf{x}_t$, is now specified as follows:

$$\ln \lambda_t = \alpha + \beta \mathbf{x}_t + \epsilon \tag{3}$$

where ϵ has a gamma distribution. This model assumes that the coefficient of variation of the expected count increases linearly with the expected count. It has an additional overdispersion parameter, θ, where

$$\text{Var}(Y_t) = E(Y_t)\,(1 + \theta E[Y_t]) \tag{4}$$

Setting $\theta = 0$ in Equation 4 simplifies the negative binomial model to a Poisson model. Thus one can form likelihood ratio tests of the Poisson process vs. the negative binomial. The likelihood ratio test statistic is defined as

$$\mu = \max L_0 / \max L_1 \tag{5}$$

where L_0 and L_1 denote the likelihoods of the null model (subject to, say, n constraints) and the alternative model that relaxes the constraints respectively. With large samples, $-2\ln \mu$ is distributed as a chi-square with n degrees of freedom. I report this statistic as the log-likelihood chi-squared ratio for the founding models in my tables. The log-likelihood chi-squared ratio compares the log-likelihood of each model with a null model that assumes a constant founding rate. The difference of log-likelihood chi-squared ratios of a pair of hierarchically nested models in my tables has approximately a chi-square distribution under the null hypothesis.

I use maximum likelihood methods available in the statistical package LIMDEP (Greene, 1995) to estimate the founding models. Maximum likelihood estimation revealed that models of founding rates for both microbreweries and brewpubs consistently show evidence of overdispersion. Hence I report negative binomial regression models of microbrewery and brewpub founding counts.

FINDINGS

Table 3 presents estimates from negative binomial regression models of state-level microbrewery foundings. Model 1 shows that the variables measuring the carrying capacity of the environment affect the microbrewery founding rate in predictable ways. States with more affluent residents and higher beer consumption experience higher microbrewery founding rates. Indirect institutional support also encourages microbrewery foundings. Microbrewery foundings are accelerated by the legalization of brewpubs, an organizational form that also draws on the local market for sustenance. The overdispersion parameter, θ, is statistically significant in all models in Table 3.

Density dependence in microbrewery founding rates is addressed in Model 2. Microbrewery founding rates initially rise and then fall with increases in local (state-level) microbrewery density. This result is consistent with the predictions of Hannan's (1986) model of density dependence. Nonlocal (out-of-state) microbrewery density also has a positive effect on the state-level founding rate. The mutualistic effect of nonlocal microbreweries is somewhat surprising given the expansion of some prominent microbrewers into regional and in some cases national distribution of their products. One interpretation of this result is that entry into new market segments is a contagious process that operates on a broad geographic level. A large number of viable firms existing in nonlocal areas may indicate that the new market niche has a large carrying capacity, thus attracting potential local entrepreneurs. Microbrewery founding rates are not affected by state-level brewpub density, but are negatively impacted by mass producer density. This is to be expected as microbreweries preceded brewpubs as an organizational form and they compete more directly with mass producers in output markets.

In Model 3, I find that the effect of brewpub legalization on microbrewery foundings is more complex than it would seem from Model 1. The main effect of brewpub legalization is still posi-

Table 3. Negative binomial regression models of state-level microbrewery foundings

Independent variables	Models[a]					
	1	2	3	4	5	6
Constant	–8.371* (0.960)	–2.907* (0.941)	–3.119* (0.955)	–4.743* (1.178)	–5.474* (2.445)	–2.308 (2.790)
State per capita annual personal income (thousands of constant 1987 dollars)	0.3021* (0.0467)	0.0594 (0.0319)	0.0645* (0.0326)	0.0618 (0.0333)	0.0638 (0.0329)	0.0622 (0.0332)
State per capita annual beer consumption (gallons)	0.0547* (0.0262)	0.0244 (0.0238)	0.0199 (0.0244)	0.0184 (0.0249)	0.0200 (0.0245)	0.0179 (0.0250)
% of state population living in dry areas	–0.0115 (0.0143)	–0.0067 (0.0116)	–0.0060 (0.0118)	–0.0065 (0.0119)	–0.0060 (0.0118)	–0.0067 (0.0120)
Brewpub legality (1 = legal; 0 = illegal)	1.9707* (2.057)	0.2648 (0.1841)	0.5785* (0.2253)	0.5496* (0.2278)	0.5419* (0.2290)	0.5910* (0.2321)
State microbrewery density		0.3681* (0.0373)	0.5184* (0.0499)	0.5283* (0.0525)	0.5219* (0.0520)	0.5282* (0.0526)
(State microbrewery density)^2/100		–1.0027* (0.1806)	–0.8871* (0.2257)	–0.9010* (0.2339)	–0.8863* (0.2287)	–0.9099* (0.2336)
Out-of-state microbrewery density		0.0075* (0.0014)	0.0068* (0.0014)	0.0041 (0.0022)	0.0059* (0.0020)	0.0044* (0.0022)
State brewpub density		–0.0019 (0.0128)	0.0015 (0.0132)	0.0044 (0.0137)	0.0016 (0.0133)	0.0054 (0.0142)
National mass producer density		–0.0394* (0.0069)	–0.0359* (0.0070)	–0.0182* (0.0085)	–0.0207 (0.0122)	–0.0296* (0.0127)
Brewpub legality × state microbrewery density			–0.1879* (0.0625)	–0.2039* (0.0658)	–0.1923* (0.0641)	–0.2046* (0.0657)
Volume of imports (millions of gallons)				0.1754* (0.0831)		.2042* (0.1184)
Industry concentration (4-firm ratio as a percentage)					0.0243 (0.0249)	–0.0321 (0.0357)
θ (overdispersion parameter)	2.1795* (0.3136)	0.2620* (0.1221)	0.2876* (0.1338)	0.3020* (0.1333)	0.2986* (0.1378)	0.2970* (0.1306)
Log likelihood chi-squared ratio	1228.2	1452.6	1459.0	1464.5	1459.8	1465.3
Degrees of freedom	5	10	11	12	12	13
Number of cases	2865	2865	2865	2865	2865	2865
Number of events	335	335	335	335	335	335

*$p < 0.05$
[a]Standard errors are in parentheses.

tive. But the interaction of brewpub legalization with microbrewery density exerts a negative effect on the microbrewery founding rate. In other words, the effect of brewpub legalization on microbrewery founding rates varies over levels of microbrewery density. The estimates in Model 3 suggest that if four or more microbreweries exist in a state, the overall effect of brewpub legalization on microbrewery founding rates is negative. One interpretation of this finding is that once brewpubs are legalized, entrepreneurs can choose to enter either the more established microbrewery or the fledgling brewpub segment. Higher levels of microbrewery density under such conditions imply greater competition. Therefore potential entrepreneurs may choose to enter the brewpub segment instead. This interpretation is also consistent with an unfolding of the resource-partitioning process within the microbrewery segment of the industry.

Models 4 and 5 test the niche formation and resource-partitioning arguments separately. Model 4 supports Hypothesis 1. Microbrewery founding rates increase with the volume of imports (the indicator of niche formation). Model 5 does not support Hypothesis 2—the effect of industry concentration (the indicator of resource-partitioning) on the microbrewery founding rate is negligible.

Finally, Model 6 pits the niche formation and resource-partitioning explanations for the entry of firms into new market segments in mature industries against each other. The results suggest that niche formation is primarily responsible for the entry of microbreweries into the brewing industry. The effect of factors endogenous to the industry implied in the resource-partitioning hypothesis are insignificant once the exogenous changes suggested by the niche formation scenario are taken into account. The effects of microbrewery density and brewpub legalization on microbrewery founding rates are consistent with earlier models. To test the robustness of Model 6, I added a variable signifying the population mass of microbreweries (annual production output). Barnett and Amburgey (1990: 82–84) argued that if larger organizations within a population generate stronger competition, then population mass should lower the founding rate. In this supplementary model, estimates of which are not provided here, I found that population mass does not affect the founding rate of the microbreweries significantly. Parameter estimates of variables included in Model 6, however, are robust to the addition of the population mass variable. The lack of a population mass effect may signify a great degree of differentiation within the microbrewery population.

Table 4 presents estimates from negative binomial regression models of state-level brewpub foundings. Model 7 shows that the carrying capacity variables affect the brewpub founding rate in intuitive ways. The effect of the income variable is statistically significant in Model 7, but loses its significance in subsequent models. The overdispersion parameter, θ, is statistically significant in all models in Table 4. Model 8 accounts for density-dependent effects on the brewpub founding rate. As predicted by the density model (Hannan, 1986), state-level brewpub density exerts a nonmonotonic effect on state-level brewpub founding rates. Given the local nature of the brewpub segment, it is not surprising that national mass producer density does not exert an appreciable effect on the brewpub founding rate. Out-of-state brewpub density has a positive, but inconsistent effect on the brewpub founding rate, adding credence to the 'entrepreneurship as contagion' explanation offered earlier for nonlocal effects on microbrewery foundings. In addition, state-level microbrewery density has a positive effect on the state-level brewpub founding rate. This result suggests that the spread of the microbrewery organizational form had a legitimating effect on the founding process of brewpubs.

Models 9 through 11 test the two alternative Hypotheses 1 and 2 derived from niche formation and resource-partitioning theory. The results suggest that the founding of firms in the brewpub segment of the U.S. brewing industry is mainly driven by the niche formation process. The greater the volume of beer imports, the indicator of niche formation, the greater the brewpub founding rate. This result supports Hawley's (1988) suggestion that niche emergence may be partly responsible for the generation of new organizations. As in the case of microbreweries, I found that the parameter estimates in Model 11 were robust with respect to the addition of a variable, total brewpub production, that is a proxy for population mass. It is interesting that the entry of firms into the microbrewery and brewpub segments of the U.S. brewing industry is better explained by niche formation than by resource-partitioning. I will explore the implications of

Table 4. Negative binomial regression models of state-level brewpub foundings

Independent variables	Models[a]				
	7	8	9	10	11
Constant	–1.491 (1.083)	–2.652 (1.486)	–4.487* (1.495)	–3.147 (8.902)	11.120 (9.389)
State per capita annual personal income (thousands of constant 1987 dollars)	0.1417* (0.0461)	0.0013 (0.0340)	–0.0028 (0.0331)	0.0012 (0.0341)	–0.0026 (0.0328)
State per capita annual beer consumption (gallons)	–0.0060 (0.0229)	0.0282 (0.0203)	0.0231 (0.0193)	0.0282 (0.0204)	0.0229 (0.0201)
% of state population living in dry areas	–0.0152 (0.0153)	–0.0041 (0.0116)	–0.0056 (0.0111)	–0.0042 (0.0116)	–0.0052 (0.0109)
State brewpub density		0.0978* (0.0216)	0.0986* (0.0211)	0.0977* (0.0223)	0.1025* (0.0216)
(State microbrewery density)^2/100		–1.1222* (0.0309)	–0.1209* (0.0344)	–0.1220* (0.0317)	–0.1250* (0.0335)
Out-of-state brewpub density		0.0027* (0.0006)	0.0002 (0.0007)	0.0026* (0.0013)	0.0018 (0.0013)
State microbrewery density		0.0844* (0.0264)	0.0725* (0.0260)	0.0842* (0.0265)	0.0741* (0.0262)
National mass producer density		0.0531 (0.0446)	0.0061 (0.0452)	0.0559 (0.0613)	–0.0883 (0.0663)
Volume of imports (millions of gallons)			0.4037* (0.0966)		0.4897* (0.1047)
Industry concentration (4-firm ratio as a percentage)				0.0050 (0.0903)	–0.1639 (0.0969)
θ (overdispersion parameter)	1.3736* (0.1629)	0.5225* (0.0975)	0.4571* (0.0920)	0.5222* (0.0975)	0.4502* (0.0914)
Log likelihood chi-squared ratio	476.9	604.1	621.2	604.1	624.9
Degrees of freedom	4	9	10	10	11
Number of cases	305	305	305	305	305
Number of events	588	588	588	588	588

*$p < 0.05$
[a]Standard errors are in parentheses.

these findings among others in the discussion that follows.

DISCUSSION

This paper examined two alternative explanations for the entry of firms into new market segments in mature industries. First, niche formation theory derives its explanatory power from factors that are exogenous to the industry such as changes in consumer taste or basic technology. These exogenous changes create unmet demand for new products and services, and entrepreneurs recognizing potential opportunities found organizations, often with new forms. Second, resource-partitioning theory relies on structural changes within an industry that lead to the fragmenting of the industry into generalist and specialist niches. Generalist organizations focus on producing standardized products and services for the mass market. Opportunities in the specialist niche are ignored either because they are unattractive due to a lack of scale economies or because of organizational inertia. The reluctance or the inability of generalist organizations to expand into the specialist niche allows organizations with new specialist forms to be founded in mature industries. Tests of these two theories on the entry of firms into the microbrewery and brewpub segments of the American brewing industry provide strong support for the niche formation hypothesis. The lack of support for the resource-partitioning model may stem from at least two limitations of this study. First, we may have to measure the degree of resource-partitioning more appropriately. Second, we may need to reconceptualize the resource-partitioning process.

Market concentration has been used widely as a measure of resource-partitioning, but it is a weak proxy at best. At the heart of the resource-partitioning model is an argument that a decline in organizational diversity within an industry will lead to the entry of new specialist firms. Rather than employ market concentration as an inverse measure of organizational diversity, it would be preferable to measure organizational diversity within an industry directly in terms of diversity in technologies, products, markets, and internal structures.

Resource-partitioning has been typically conceptualized as a one-time phenomenon. For example, the design of this study assumed that increasing market concentration and the accompanying decline in product diversity among mass production breweries would simultaneously create opportunities for specialist firms in the microbrewing and brewpub segments of the brewing industry. In contrast, I would like to suggest a different approach, one that conceptualizes resource-partitioning as a continuous, cyclical process that repeats itself as industries and, more generally, market niches within them mature.

By virtue of their producing and marketing packaged products, microbreweries exhibit greater interdependence with mass production breweries. The brewpub organizational form occupies a niche that is far removed from the mass producer segment. This reasoning is partly supported by the effects of mass producer density on the entry of firms into the microbrewing and brewpub segments. This study considers the effect of resource-partitioning due to structural changes in the mass producer segment on the entry of firms into new market segments in a mature industry. Resource-partitioning within the mass producer segment of an industry is more likely to affect the entry of firms into the new market segment that has a greater overlap with the mass producer segment, in this case the microbrewery segment.

The intriguing effects of brewpub legalization on microbrewery foundings suggest that similar forces may be at work within the microbrewing segment of the industry. One interpretation of these effects is that brewpubs are a variation of microbreweries that arise due to structural changes within the microbrewing segment of the industry. Microbrewery foundings may be lower in states that have legalized brewpubs because entrepreneurs react to overcrowding in the microbrewery segment and found brewpubs instead. This interpretation is consistent with results that show a positive effect of microbrewery density on the brewpub founding rate in a given state. Brewpub products may find easier acceptance in states with a significant microbrewery presence—consumers can now buy similar products for consumption at and away from home. In states where brewpubs are legal, microbreweries often serve as organizational blueprints for entrepreneurs planning to enter the industry. But if the microbrewing segment is crowded or dominated by a few firms then potential entrepreneurs are likely to found a brewpub,

an organizational form that is new to the craft brewing segment of the brewing industry. A thorough examination of the cyclical nature of the resource-partitioning would require data on market concentration in the microbrewery segment of the industry. Reliable data on microbrewery sales are now available for the past 8 years (Institute for Brewing Studies, 1996), but a longer time frame is probably required for an adequate test of the modified resource-partitioning hypothesis. I plan to continue collecting such data so that I can examine this proposition in the future.

My attempt to conceptualize resource-partitioning as a continuous cycle within an industry is consistent with punctuated models of industry evolution. High levels of industry concentration in mature industries often reflect the success of dominant mass production firms at producing low-cost standardized products. But in direct opposition to this very trend toward standardization emerges another trend towards differentiation. There is some anecdotal and empirical evidence in support of such a dialectical, cyclical process. Petersen and Berger (1975) argue, for instance, that specialist forms in the music industry attempt to expand by standardizing their products, thus renewing the concentration process. Similarly, Anderson and Tushman (1990) propose a cyclical model of technological change where the emergence of a dominant design sets the stage for an era of incremental change abruptly followed by the next technological discontinuity. In examining the sources of dominant designs in four industries—cement, container glass, flat glass, and minicomputers—they find that on the average new entrants are more likely to introduce designs that destroy the technological competence of incumbent firms. While Anderson and Tushman (1990) focus on technological evolution, this study addresses the evolution of market niches within an industry and the organizational forms that occupy these niches. In this case, the emergence of a dominant organizational form sets the stage for a discontinuity in product markets, a discontinuity that is often introduced through the entry of organizations with new forms (see also Romanelli, 1991: 93–96 for a recent discussion of organizational speciation).

This paper evaluates two alternative theories, niche formation and resource-partitioning, that seek to explain the entry of firms into new market segments within a mature industry. Entrants with new organizational forms contribute to an increase in organizational diversity within an industry. An understanding of the sources of diversity is central to an evolutionary perspective on organizations and industries. At an abstract level, a system characterized by greater diversity can respond better to changing environmental conditions. In terms of industry structure, one that is composed of firms manufacturing a diverse set of products is more likely to satisfy the needs of a heterogeneous market. Although the conclusions drawn here are based on findings from the brewing industry, they are broadly generalizable to the entry of firms into new market segments in mature industries that are characterized by low levels of organizational density accompanied by high degrees of concentration. Similar structural conditions exist in industries such as newspapers, book publishing, music recording, retailing, life insurance agencies, advertising, and managerial consulting. In fact, since the resource-partitioning process is likely to have occurred at an earlier time in some of these organizational populations, they might provide added insight, particularly with regard to the prevalence of a cyclical process of resource-partitioning within newly emerging segments of an industry.

ACKNOWLEDGEMENTS

Support for this research was provided by the University of Michigan Business School. I would like to thank Bill Barnett, Glen Dowell, Brad Killaly and Will Mitchell for comments on earlier versions of this paper.

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