# Lessons *Not* Learned:

# Organizational Population

# Path Dependency and Devolution

# in the U.S. Footwear Industry[1]

by

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**Abstract**

While modes of evolution have been proposed (Aldrich and Ruef, 2006), the topic of devolution, which is defined as the decline in the aggregate production of a national population of organizations, has not received much attention. Yet, one is struck by the many examples of this in both North American and Western Europe. The paper provides a general ecological model based on the consequences of globalization for resource crowing and the failure to respond to post-industrialization demands for much greater variation or specialization. Path dependency in the organizational population or the lack of population learning is defined and measured in a fifty year study of the U.S. footwear organizational population.

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As evolutionary thinking returns to the social sciences (Aldrich and Reuf 2006; Baum 1996; Nelson and Winter 1982; Roemer 1990; Sztompka 1993; Walsh 2005), it is important that robust models be constructed that do not repeat the mistakes of the past. One of the more telling critiques was made by Collins (1988) who observed that classical theorists had not discussed failed evolution. At the level of organizations and organizational populations, one is struck by the number of recent examples of how organizational populations within particular countries have devolved, that is grown smaller, in part because of globalization (Hage 2006). One concept that is helpful in explaining failed evolution or devolution is path dependency of various kinds such as technological lock-in (Arthur 1989; David 2001; Meyer and Schubert 2007), managerial cognitive single loop thinking (Argyris and Schön 1996) or institutional rigidities (Campbell 2004; Mahoney 2000). But any theory of devolution should also contain a model of evolution as well that involves successful responses to environmental changes. Here the concepts of organizational learning (Brown and Duguid 1998; Ingram and Baum 1997; Kogut and Zander 1996; Nonaka and Takeuchi 1995), double-loop thinking (Argyris and Schön 1996) and path creation (Garud and Karøe 2001, 2003; Meyer and Schubert 2007) are helpful. Sørensen (2000) was the first to raise the question of learning at the organizational population level, which is the more appropriate analytical level for the problem of organizational evolution or devolution. Some organizations may learn and thus survive while others may not; the real question is, does the organizational population evolve as a whole or does it devolve? Joining the two concepts together allows us to create a very useful variable for explaining the evolution or devolution of organizational populations, path dependency vs. learning. Together these can be measured by whether or not firm strategies have changed.

Another criticism of evolutionary theory made by Nisbet (1969) and Tilly (1984) is that it does not describe historical processes and allow for alternative pathways. By focusing on technological regimes (Malerba 2005; Pavitt 1984) both of these objections can be met. Some countries have been more innovative in some sectors rather than others (Hall and Soskice 2001). Likewise the problem of path dependency is greater in those sectors where the sunk costs of machinery are greater, and path creation is much easier in those sectors where the cost of product development is low. All of these factors, and others, lead to quite different patterns of evolution and devolution within societies and between them.

A general theory of evolution and devolution of organizational populations also needs to have a source of major environmental change, whether in the market place and/or in the technology. The theoretical argument of this paper is that starting in the 1960s, many organizational populations had to learn new rules of competition because the twin social forces of globalization and post-industrialization altered the nature of the resource base. The former produced a rapid crowding of the resource base while the later shifted the availability of resources in new directions as reflected in new consumer demands for quality and customization of products and services. To survive, organizational populations had to unlearn the previous rules of success or routines (Nelson and Winter 1982) and learn ones almost the opposite. Although there are theorists such as Giddens (1990) that do not perceive post-industrial society, he never considers that increasing expenditures in research and development (R&D) or the emergence of mass college education may have considerably altered the basis of competition from productivity to innovation. The values of consumers have shifted toward preferring technological advance, “green” products, and customization (see Hage and Powers 1992; NSF 2006).

The objective of this paper is to test a theory of evolution vs. devolution in the U.S. organizational population of footwear during the period of 1940-1989 (for other studies of this industry see Audia et al. 2001; Sørenson and Audia 2000). The logic of the research design requires a division into two periods, pre and post globalization and post-industrialization: 1940-64 and 1965-89. Mortality rates are computed to ascertain whether organizational strategies that reduce the hazard rate of mortality shifted in the second period. This allows us to determine what strategies are effective. Founding rates are also computed to determine if the organizational strategies shifted across these two periods as well and in what direction. The data base was created from a number of sources and includes 3,804 companies, of which 3,519 are single plant or unit companies and 285 are multi-unit companies, of these 272 are medium in size and only 13 are large (see Table 1). The preponderance of many small firms reflects the presence of a highly differentiated market and the lack of a standardized technology as well as the absence of barriers of entry (Szenberg et al. 1977). In this specific organizational population, there was relatively less technological lock-in because the new automated equipment developed during the 1960s could be rented from the major supplier at relatively low cost. As one can also observe in Table 2, the process of consolidation, which is the typical evolutionary process in the population ecology literature (see Hage 2007; Sørenson and Audia 2000) was quite slow and actually reversed by the advent of globalization and post-industrialization.

## A General Model of Evolution and Devolution

Just as path dependency and organizational learning are a natural pair of concepts so is the pair evolution and devolution. Evolution is defined as growth in the aggregate production of some product or service within national boundaries where that growth is accompanied by an increase in the diversity of product and customers. Devolution is the opposite, a reduction in production and a decline in diversity. These definitions are quite different from what is usually studied in organizational ecology (Baum 1996), namely the population size of firms such as automobile companies (Hannan et al. 1998) or hotels (Baum and Ingram 1998; Ingram and Baum 1997). This approach has not provided a general theory about the evolution and devolution of organizational populations and what accounts for these patterns of social change.

## Definition of the core concept

What is the definition of path dependency vs. organizational learning in an organizational population?

Path Dependency vs. Learning = Amount of change in strategy

This definition allows us to unite a number of different organizational literatures with those in organizational ecology. Strategies represent major routines (Nelson and Winter 1982) and thus the knowledge base of the firm and in the aggregate the knowledge base of the organizational population. The new endogenous theory of economic growth starts with the same definition of knowledge, that is the design for the production of a product (Walsh 2005). One advantage of this definition is that it works at both the level of the firm and the level of the population. Changes in a firm's strategy or routines are a precise definition of organizational learning while the absence of change is an equally precise definition of path dependency. Although the definition allows for changes in existing firms as well as in new firms, our data analysis concentrates on the establishment of new firms, foundings, and whether there is a shift across time in their strategies. At the population level, new firms with new strategies reflect the variety that is an essential component of the organizational ecology model of population evolution (Aldrich 1979). Organizational ecologists by examining such attributes as organizational size and the generalist vs. specialist strategy are focusing on some general routines and their consequences for mortality (Carroll 1985). These same ideas can be used to measure changes in strategies across time as reflected in the characteristics of the founding firms, the movement from a generalist to a specialist strategy, for example, is one of our foci of interest.

Path dependency is to be expected in existing firms because of the difficulty of changing routines. Hannan and Freeman (1984) have argued that major changes in routines will cause firms to disappear but this restriction does not necessarily apply to a new firm that starts with a new strategy and its implied routines because it is not changing its existing routines. Indeed, one would expect that across time there is some variation as new firms are founded and experimentation on the margin occurs. This was the central insight of Sørensen (2000) who proposed accumulating the number of foundings and labeling them as trials as a measure of population learning. But is it? *Without a measure of a change in strategy*, it is difficult to assume that there necessarily has been any learning at the population level. It could be that the firms start with exactly the same kind of strategy that other firms have been using in the past. Indeed, the iron cage model of organizations (DiMaggio and Powell 1983) would make this prediction. Organizational imitation is a powerful force for all the reasons that they enumerate in their article. Therefore, measuring path dependency vs. organizational learning at the aggregate level of an organizational population allows us to incorporate the concept of variation, if there are changes, at the same time that it is a precise measure of population learning. It also has the advantage of illuminating why some organizational populations devolve even if the size of the consumer population increases. Furthermore, it avoids simply citing some new firms with effective strategies. A large proportion of the organizational population has to escape path dependency and to learn for it to evolve.

A separate question is whether the organizational population learning is effective or not, that is, that it results in an increase in the aggregate production. When this occurs one can then state that the organizational population has been flexible and evolved relative to the various challenges posed by environmental change. This is described as “adaptiveness” in the organizational literature, but it must be noted that in organizations the mechanisms of adaptation are different than those of biological organisms and the organic metaphor breaks down. Most significantly, the role of reproduction in biological and organizational populations is different as the latter lacks a genetic mechanism. With organizations some variations are selected because they fit their environments better than others and the task is to explain what is the better fit and why. This is something that is missing from general discussions of population ecology (see Aldrich 1979; Aldrich and Reuf 2006), and something we attempt in this paper.

## Definitions of general environmental changes that require organizational population learning

To demonstrate path dependency and organizational learning, whether in the firm or at the organizational population level, it is necessary to show that there is some environmental change that necessitates that something be learned. To construct a general model of organizational population evolution and devolution, we need to be able to code environmental changes in a way that allows us to predict their consequences for the organizational population and more specifically its strategies.

In this study we focus on two generic sets of factors. The first are variables that indicate that the resource base is becoming crowded. One generally underappreciated cause of crowding is the emergence of mass production techniques. For example, the creation of the pastuerization of beer allowed local breweries to produce for the national market and thus led to rapid consolidation of the industry, that is to a decrease in the number of breweries in aggregate (Hannan and Freeman 1989). It thus paralleled the introduction of Ford’s mass production techniques that had the same impact on the automobile industry (Hannan et al. 1998). More generally, Chandler (Chandler 1977) documented the use of this generalist strategy before these organizational population studies were made. More recent changes that have had the same consequence across a number of different organizational populations are the deregulation of markets, the reduction of tarrifs allowing products to be imported into the United States, and a considerable reduction in the cost of transport. This has stressed a number of organizational populations not just in this country but in Western Europe as well. This can be defined as globalization of the production of products and services.

Quite an opposite set of factors are those that allow for specialization. Certain industrial and service sectors have resisted the decline in the size of the organizational population because of the diversity of tastes. Newspapers (Carroll 1987) is a good example, as is footwear. Shoes have to be made in different sizes by gender, age, and activity. What is missing is a general set of categories that would explain the number of viable market niches that are possible. All that one can say is that with post-industrialization, there was a strong movement towards the customization of tastes, which in turn allowed for many more niche creations within even generalist markets (Hage and Powers 1992). In summary, we have two important environmental changes: globalization and post-industrialization, which we now discuss relative to their impacts on the resource base of an organizational population.

## Globalization and the crowding of the resource base

Globalization has come to be used to cover a wide variety of different meanings including trade, financial flows, immigration, export of jobs, cultural homogenization, and the like. For the literature on organizational ecology the concept of globalization can be defined as radical increases in the ecological density of a population because a number of countries are now exporting a product or service into a specific national market. Conceptually as we have already suggested, this produces a crowding effect.

For the footwear sector in the U.S. market, the evidence for globalization is strong. Certainly the penetration of imports rose from 2 percent in the mid 1950s, to 4 percent in 1960 to 30 percent in 1970 and 81 percent in 1989 (FIA various years; Szenberg et al. 1977). Another sense, in which the word globalization is used, is the diversification of country of origin for imports: Britain, France, Germany, Italy, Spain, and Japan, and developing countries such as Brazil, Mexico, Taiwan, and more recently, Indonesia, Thailand, and China.

### Post-Industrialization and the demands for customization of products and services or the creation of specialized niches

While the globalization argument stresses the crowding that occurs as the number of countries from which a product is imported increases, post-industrialization focuses on the proliferation of narrow market niches that do not last very long because of constant changes in either technology and/or tastes. The causes of this instability in tastes and in technologies flow from constant investment in R&D and movement away from mass markets because of higher education spreading throughout the society (Hage and Powers 1992). For organizational populations within a country post-industrialization represents a shift in the resource base to companies that can respond rapidly to fluctuations in market demands because of flexible manufacturing and to companies that are highly innovative and especially in new product niches that reflect post-industrial life styles.

Relative to the standard three dimensions for describing the niche categories in footwear--age, gender, and activity--all of these expanded as well as allowed for more customization and niches for quality. New age categories were created as well as new gender categories. But the most important expansion occurred in the proliferation of leisure time activities and the creation of a considerable variety of specialized life styles that had their distinctive footwear.

Although the average reader might laugh, some shoes have become quite high tech, not only because of the development of new synthetic materials but the addition of sensors of various kinds. Children have taken to shoes that have lights on them. More obvious is the constant rate of product innovation, most of which has been concentrated in two large, new companies, Nike and Reebok (I.D.C.H.: vol v, 372-77). The term athletic shoes obscures the many new market niches from jogging and aerobic exercises to hiking and boating (ILO 1992; OECD 1976) that have opened and are either being exploited domestically or more typically by imports from these two companies. Since Nike and Reebok moved their production off-shore, they are not part of the survival of a domestic footwear organizational population. But they do illustrate how new firms can adopt new strategies and become quite successful. In particular, their strategy has been to become large generalist firms that produce for many specialist markets. And they have pursued R&D aggressively to build knowledge about various kinds of shoes that can improve athletic performance.

## Organizational population responses to globalization and post-industrialization: path dependency vs. learning

The key point about both of these environmental changes, whether crowding or the need to specialize because of the new rules of competition, is that they are likely to lead to higher rates of mortality, at least initially, in existing firms. Therefore, the first immediate consequence is a decline in the number of surviving firms after the advent of an environmental change. The second response is an increase in variation as organizations are founded with new strategies designed more or less well to be appropriate for the new rules of competition.

What are the correct responses, that is, ones that represent a better fit for the new resource environment? Although we have provided a theoretical argument about the appropriateness of specialized niches and their ability to make footwear more high tech and to respond rapidly to shifting tastes, there are other ways of justifying this analysis. The answer to this question is based on the following sources and empirical arguments: (1) the recommendations in what might be called the practical industrial literature about lessons for survival; (2) the nature of strategies in other industrialized countries that are doing well with globalization and post-industrialization; (3) the experience of old firms that were previously successful under the old competitive rules; and (4) the experience of new firms that are founded both before and after the stresses of globalization and post-industrialization have appeared. These last two points are explored in this paper.

Relative to point number one, in various reports the ILO, which did extensive studies of the footwear industry worldwide, recommended strategies of survival. Their repeated argument was the importance of highly specialized firms that captured a small market niche and especially one associated with the characteristics of the country. Thus, a good example is the success of American cowboy boots.

Still another buttress for our normative argument is to examine what forms in the same industry in other countries succeed with the new rules of competition. In particular, the Italian inter-organizational network became celebrated because of the famous book, <u>The Second Industrial Divide</u> (Piore and Sabel 1984) that demonstrated the advantages of flexible technologies and small firms in networks. This is an especially interesting case because the Italian workers were paid higher wages than their American counterparts. Thus, Italy becomes a model for how to respond to globalization and post-industrialization and maintain employment and a high wage scale as well. Leaving aside the special case of Italian inter-organizational networks, what is especially interesting about Italian firms is their small size, which along with their flexible technology, makes them highly flexible (Lazeron 1993).

## Methodology

As we have observed, organizational ecology, although it has examined the stresses of deregulation and by implication the introduction of mass technologies and of innovative new products, has not studied globalization and post-industrialization as changes in the rules of competition with consequences for the nature of the resource base. There are a number of reasons for this omission, including the emphasis on survival rates rather than the foundings of new firms, the recent advent of both globalization and post-industrialization and therefore the absence of data sets that have enough time before and after the advent of these two changes in the rules of competition, and finally and perhaps most critically a model of population path dependency and of learning defined by the absence or presence of changes in the strategies of founding firms. Each of these problems is corrected in this study of the U.S. non-rubber footwear industry.

## Sample Size

During the course of 50 years, 3,804 distinct shoe-manufacturing plants existed. Of these, 973 were born prior to 1940, 1,102 in the next decade (see Table 1), 675 in the decade of the 1950s with another drop to 490 in the 1960s. What is most interesting about Table 1 is that more companies were founded in the 1980s than in the previous decade. This provides the first piece of evidence about population learning—entrepreneurs appear not to have been discouraged.

In 1940 there were 1161 plants, of which 245 (21%) were in multi-unit companies and at the end of the period in 1989, there were 536 plants of which 185 (34%) were in multi-plant companies. Table 2 provides information about the concentration of production in multi-plant companies by both measures of size. It might be noted that the percent of plants in multi-plant companies reached a peak of 43% in 1977 and then steadily declined after that, indicating some of the interesting effects of globalization and post-industrialization. One interpretation is that there is not only path dependency but a lag in learning new lessons.

The cessation of all domestic footwear manufacturing is defined as company mortality even if the company continued to import shoes from another country. Interestingly enough we have two multi-plant companies that stopped all production and then some time later moved back into shoe production. We have counted these as separate multi-plant companies.

### Measuring generalist vs. specialist strategies

We measured organizational strategies for survival, most of which have been discussed in the organizational ecology literature and are considered to be quite generic as variations on the theme of large size and a generalist strategy: The variables are:

- average plant size in the company;
- number of plants in the company;
- emphasis on a generalist strategy;
- failure to report output.

Rather than simply use total production size, which is quite common in the literature, we found that there is a much better fit, as indicated by the size of the $X^2$, by using the log of the average plant size, the log of the average plant size squared and the number of plants. A logarithmic transformation of average plant size is helpful because the mode is around 500 pairs per day but the distribution extends to over 10,000 pairs per day.

The relationship between average plant size and survival is curvilinear because very small size plants as well as large plants have competitive advantages. Small size plants are generally in highly specialized niches of custom made shoes, typically at the high end of the footwear market.

Interestingly, this is not just restricted to women's shoes but includes all categories. Therefore, we use both the logarithm of average plant size and the square of this term. We considered modeling various definitions of small production (e.g. less that 45 pairs per day), given some of the previous work on this, but found that the addition of this third variable did not improve the fit.

We modeled the number of plants as a term that decays somewhat quickly, the inverse of the number of plants, i.e. 2 plants = 1/2, 3 plants = 1/3, etc. This has an effect similar to taking a logarithm but is more appropriate for an integer variable. Together average plant size and number of plants model the economies of scale and scope.

The degree of specialization (also abbreviated as span in the tables) was estimated by counting the number of different types of shoes and also the number of different age/gender categories in which they were produced. The age/gender categories are infants, children, boys and youth, misses, men and women. Examples of product variety are high style, work shoes, boots, moccasins, sandals, and slippers. Fourteen varieties of products were distinguished fairly consistently in the directories over the years. Extreme forms of specialization such as burial shoes, doll shoes, and ice skates were grouped as other. These two measures were then multiplied together and then the square root of this was taken.

Finally, failure to report output is considered to be an indication of the lack of professional managers or of a bureaucracy. We tried to estimate whether this was a function of the size of the company but this problem was wide-spared and especially in the decade of the 1980s, indicating the breakdown of the industry in another way. Obviously, one would want to control for this in any case. There are 514 companies for which we do not have shoe production size.

Essentially the hypothesis is that the first three measures of organizational strategy, which are variations on a generalist strategy, are expected to produce higher survival rates in the period prior to post-industrialization and globalization and the reverse after the advent of these changes in the rules of competition. The last variable is expected to have higher mortality rates in both periods.

## Modeling Globalization and Post-Industrialization

The period of 1965-1989 or the last twenty-five years of our data analysis is the period when both globalization and post-industrialization began to change the rules of competition. But we want to separate as much as we can the globalization arguments, our main concern here, from those involving post-industrialization.

Central to our argument about globalization is that imports represent a sudden and dramatic increase in domestic or national ecological density. We tried to model this as a combination of company density and various ways of interpreting imports as increases in competing companies but our various attempts to do so failed as measured both by the size of the $X^2$ and by the pattern of findings. Hence, we are employing both company density (and of course company density squared) along with imports and imports squared to reflect the impact of globalization qua foreign company density. In other words, the logic of company density is employed to model both ways in which ecological density increases.

Unfortunately we do not have a comparable method for modeling post-industrialization. If we had a measure of the proportion of all shoes that were leisure shoes, this might be a good approximation for the advent of post-industrialization and certainly consistent with our arguments above since most of the new shoe specialties were located in this sector. Barring this, we used a simple dummy variable to capture the post-industrialization period, 1965-1989. We expect the hazard rate for those organizations that are using the strategies described above to increase in this second period.

## Measuring organizational population dependency vs. learning: Changes in the organizational strategies in foundings

Not only do we want to measure changes in the rules of competition on the basis of which organizational strategies facilitated survival once the stressors of globalization and post-industrialization occurred but we also want to examine what strategies the new firms adopted, that is, whether there was any population learning as measured by changes in organizational strategies across time.

Obviously, we propose measuring changes with the same set of variables. If in the aggregate there were more foundings of specialized small firms in the second period, 1965-1989, then we would argue that at the population level, learning has occurred. If there are fewer, than we have path dependency.

## Statistical Analysis

In order to model and test these effects statistically we use discrete time event history models (Tuma and Hannan 1984). Conceptually the dependent variable is the hazard rate for closing a company. The models that we use are estimated with a complementary log-log function (Allison 1982). Denoting the hazard as $\pi_\tau$ the general form of the model is:

$$\mathrm{Log}(-\log(\pi_\tau)) = \alpha + \beta X + \beta X_\tau + e$$

In this model the baseline hazard rate is constant but it is modified by two sets of independent variables. The first, without the subscript, have only one value for each company for the entire period. The second change value on an annual basis, denoted by the subscript t. This model can be extended so the baseline hazard rate is also a function of time, and to cover effects that change over time by interacting the independent variables with a variable representing time, as follows:

$$\text{Log}(-\log(\pi_\tau)) = \alpha_1 + \alpha_2 f(t) + \beta X + \beta X_\tau + \beta X_\tau f(t) + e$$

We fit the model with maximum likelihood methods using the SAS procedure LOGISTIC (SAS 2000). With these methods model fit and the contribution of individual variables can be evaluated with likelihood ratio tests.

In the models involving interaction effects, each of these were plotted to be sure that in fact there was a true interaction effect. In each instance, this was the case. These graphs are reported because in many cases the pattern is quite complex and especially for those variables that have curvilinear relationships with either mortality or foundings.

## The Research Findings

The analysis is reported in two stages. First, we report the pattern of findings relative to the best strategies for survival before and after the advent of globalization and post-industrialization in Table 3. Second, we report the patterns of population learning before and after these stressors as reflected in the strategies used by founding firms in Table 4.

Before reporting the analysis of which organizational strategies reduced the mortality rate in the two distinct periods of 1940-1964 and 1965-1989, let us consider the effects of our measures of what might be called the size of the ecological space. The measure of total shoe production is significant and positively so as one would expect given the flood of imports associated with globalization. Likewise, per capita spending is significantly and negatively related to mortality, again as one would expect. The same is true for exports, which is also associated with reductions in the hazard rate for mortality.

## Organizational Strategies for Survival

As expected, and consistent with the emphasis in the organizational ecology, the management, and the organizational sociology literatures, large organizational size does confer survival benefits. The greater the number of plants the lower the mortality across the entire period. The log of average plant size is curvilinear. What this means is that very small plants that produce highly customized and high price shoes, whether high style, cowboy boots, or orthopedic shoes, have a higher survival rate. But as the log of plant size increases, mortality increases as well to a peak of around 250 pairs a day and then declines with larger and larger plant sizes. Thus, a generalist strategy also reduces the hazard rate. Finally, failure to report output is, as one would expect, also associated with a hazard of higher mortality.

## The Impact of Globalization and Post-Industrialization

The real issue is how much do the rules of competition change across time. We modeled this in two ways. First, we examined the impact of imports and imports squared. Imports is positively related to mortality while the square term is negative, indicating that the relationship is somewhat curvilinear. Company density is weakly related to mortality (.08) but company density squared is significantly and positively related to the hazard rate of mortality. In other words, the standard pattern of company density (Hannan and Freeman 1989) is not repeated and imports, being strongly related, is tapping into a different process than company density and company density squared but one that is measuring the crowding effect. Together, the combination of imports and of company density and their respective squared terms provide a strong argument that the rules of competition have changed.

Second, to more precisely tap into changes in the rules of competition, we examined the impact of the interactions during the period of 1965-1989 and each of the strategy variables. Within this period of globalization and post-industrialization, the effects of the strategy variables are altered and frequently significantly so. Companies with fewer plants were more likely to survive in this period as can be observed in Figure 2, which plots the relationship between the number of plants and the hazard rate of mortality in each period. The steeper line is for the second period indicates that the disadvantage of having only one plant has been considerably reduced.

Figure 3 reports a similar analysis for the relationship between the log of average plant size and the hazard rate of mortality net of the effects of all other variables. The flatter line reflects the period of 1965-1989. As one can observe the peak mortality has shifted to the right and is now around 1800 pairs a day. Furthermore, the advantages of larger and larger size accrue more slowly.

Finally in Figure 4 the analysis of a generalist strategy across time is reported. Again, the steeper line is for 1965-1989. Concretely what this states is that there was simultaneously an increase in mortality for generalist firms and a reduction in the hazard rate of mortality for specialist firms with the advent of globalization and post-industrialization. Companies with no reported output are still likely to survive, but the penalty is reduced, which is a curious finding that has several possible interpretations. One possibility is that firms are less likely to report their production because they are attempting to remain more flexible and want to adjust depending upon the shifts in markets. Consistent with this line of reasoning, it is more difficult to say what their typical production figures throughout the year will be.

## Testing for Population Dependency and Learning

Before reporting the analysis of which organizational strategies had an impact on the founding rate in the two distinct periods of 1940-1964 and 1965-1989, let us consider the effects of our measures on what might be called the size of the ecological space. In Table 2, the measure of total shoe production is significant and negatively so, as one would expect given the arguments about crowded resource bases. The growth in per capital income is not significantly related with founding rates. However, exports are also associated with increases in the founding rates.

The main effects are what one would expect given the literature cited above about what firms should do. In general, the companies have fewer plants, although they are of larger average size. The specialization variable (span) is not significant. The new firms tend not to report their output data. Hence, we see a pattern different from the generalist, large firms that are bureaucratic.

When we shift to our measures of globalization and post-industrialization, we begin to find a number of surprises. First, the volume of imports is positively related to the rate at which new firms are founded although the square of this term is negatively related. Neither density nor density squared is non-significant. Thus, it would appear that imports actually stimulate the creation of new firms! One possible interpretation for this finding is that the new firms are being founded precisely because of the dramatic increase in mortality rate, that is the entrepreneurs perceive that the resource base is less crowded than perhaps it is. As one can observe in Table 4, the relationship between the rate of creation in new firms and the mortality rate is negatively and significantly so, indicating that this line of reasoning is not correct. Exploring different lags did not change the pattern. All of this suggests that rather than entrepreneurs being discouraged by the flood of imports, they are encouraged to try their luck.

Second, by far the more interesting question is whether there have been changes in the strategies of new firms across time. In Figure 5 it is the strategy of large companies as measured by the number of plants for the two distinct periods that concern us. As can be observed, there has been a shift towards more of the new firms being founded with multiple plants. Thus, there was population learning but in this instance opposite of what the parallel Figure 2 would indicate, namely that it would be more advisable to found single plant companies. In other words, *there was path dependency in the new firm's strategies*.

Figure 6, which reports foundings by average plant size , indicates again path dependency. The pattern is the same for both periods. Again, if this is contrasted with Figure 3, one could argue that the organizational strategy in the aggregate did not shift in ways that would increase survival.

Finally, an exception that proves this general pattern of either learning the wrong lessons or not learning is what happened with a generalist strategy. As indicated in Figure 7, one observes a movement towards a specialist strategy across time; it is, however, not statistically significant. Again, this is consistent with the idea of a lag in learning. Thus, consistent with our title to this paper, this is another lesson that was not learned.

## Discussion

As we have suggested, it is important for organizational ecology to begin to develop general models of evolution and devolution because the latter is now so common. We have suggested two general sets of factors that influence the need for learning: the crowding of the resource base and the shift towards customization. Both of these indicate that specialist strategies are desirable for the survival of organizational populations. If new firms are path dependent, then the organizational population devolves. If new firms learn, then the organizational population evolves and indicates that it is flexible. The variations are selected in other words.

Probably, both the extent of the movement towards specialization as well as the protective value of specialization during the 1965-1989 period is considerably underestimated in this data set. We have measures of boots but not of cowboy boots and measures of work shoes but not of some of the distinctive styles associated with American culture as represented by the enormous success of Timberland and of L.L. Bean, that is outdoor boots including hiking boots. Above, we have already commented on the importance of leisure shoes as a distinctive category that contain many different kinds of specialty shoes, most of which were invented in the U.S. by either Nike or Reebok. However, this product innovation was associated with the development of commodity chains and the movement of jobs overseas and thus the closing of their plants within the U.S. From an organizational ecology perspective, new forms were invented to handle the new strategies, which is interesting but from the perspective of the survival of the organizational population with its national bounders still means devolution.

What is missing from this research on population path dependency and learning is the learning that occurred in the firms already in existence when post-industrialization and globalization began to impact on the resource base. We wish we had measures of the attempts upon the part of the existing firms to adjust to these new rules. Although the argument in the organizational ecology literature is that radical changes are likely to fail, it would be nice to observe whether radical changes had been tried and if they had failed. Certainly a shift in organizational size from large to small and from a generalist to a specialist strategy would be such radical changes that they are not likely to be successful. Furthermore, what complicates an analysis of this is that the large multi-plant companies are closing plants in this period but is this just slow death or is it a shift in strategy? On the basis of the data that is available we cannot tell. We do know that a number of the large firms while closing down many of their domestic plants began to import shoes from overseas.

Finally, despite these various limitations, we feel that we have established an interesting way of measuring organizational population path dependency and learning. We have grounded these measures in a general model of environmental changes. We feel that this provides a useful way of beginning to construct a general theory about organizational evolution and especially devolution, a missing element in much of the organizational population literature.

The need for such a theory is great as the process of industrial devolution persists, at least in the United States. In the automobile sector, American-owned companies now make barely 50 percent of the cars produced in the U.S. And, although robots were largely invented in the U.S., this industrial niche has disappeared from this country and is now a major component in our growing trade deficit. If one takes the 11 advanced technology sectors that the National Science Foundation tracks, in 2000 the U.S. still had a positive balance of trade of about 30 billion dollars, but by 2004 the balance was negative by over 37 billion dollars (NSF 2006).

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Table 1: Number of US shoe companies by decade of founding and number of plants.

| Decade of founding | Number of plants | | | |
|---|---|---|---|---|
| | Single plant | 2 – 9 plants | >= 10 plants | Total |
| Total Companies | 3519 | 272 | 13 | 3804 |
| Before1940 | 838 | 126 | 9 | 973 |
| 1940s | 1048 | 53 | 1 | 1102 |
| 1950s | 647 | 28 | 0 | 675 |
| 1960s | 454 | 35 | 1 | 490 |
| 1970s | 244 | 20 | 1 | 265 |
| 1980s | 288 | 10 | 1 | 299 |

Table 2: Several measures of concentration in the US non-rubber footwear industry: percent distributions of plants and production, 1940-1989

| Period | Single Plant | 2 – 9 Plants | >= 10 Plants | Total |
|---|---|---|---|---|
| Plants | | | | |
| 1940s | 78 | 14 | 8 | 100 |
| 1950s | 73 | 16 | 11 | 100 |
| 1960s | 68 | 20 | 12 | 100 |
| 1970s | 59 | 24 | 17 | 100 |
| 1980s | 60 | 24 | 16 | 100 |
| Production | | | | |
| 1940s | 59 | 22 | 19 | 100 |
| 1950s | 56 | 24 | 20 | 100 |

| | | | | |
|---|---|---|---|---|
| 1960s | 53 | 29 | 18 | 100 |
| 1970s | 42 | 36 | 22 | 100 |
| 1980s | 45 | 30 | 24 | 100 |

Table 3: Event history model of the closing of US shoe companies, 1940 - 1989

| Variable | Coefficient | SE | Probability |
|---|---|---|---|
| Intercept | -6.809 | 0.395 | <.0001 |
| Production | 0.049 | 0.071 | 0.4889 |
| Consumer spending | 0.070 | 0.056 | 0.2073 |
| Exports | -0.805 | 0.140 | <.0001 |
| World War 2 | 0.377 | 0.133 | 0.0045 |
| Founded before 1940 | -0.234 | 0.059 | <.0001 |
| Age 0 | -3.905 | 0.281 | <.0001 |
| $Age^{-1}$ | 2.317 | 0.270 | <.0001 |
| $Age^{-2}$ | -1.387 | 0.237 | <.0001 |
| Age > 24 | 0.097 | 0.063 | 0.1209 |
| Number of $plants^{-1}$ | 2.184 | 0.312 | <.0001 |
| Average size (log) | 0.561 | 0.083 | <.0001 |
| Average $size^2$ (log) | -0.052 | 0.007 | <.0001 |
| Output data missing | 2.240 | 0.249 | <.0001 |
| Degree of specialization (Span) | -0.456 | 0.022 | <.0001 |
| Imports | 0.409 | 0.133 | 0.0020 |
| $Imports^2$ | -0.043 | 0.013 | 0.0007 |
| Density | 0.079 | 0.046 | 0.0859 |
| $Density^2$ | 0.156 | 0.064 | 0.0143 |
| 1965 - 1989 | 1.407 | 0.484 | 0.0037 |
| Plants*1965 – 1989 | -0.843 | 0.376 | 0.0249 |
| Average size*1965 – 1989 | -0.331 | 0.108 | 0.0021 |
| Average $size^2$*1965 – 1989 | 0.036 | 0.009 | <.0001 |
| Output data missing*1965 – 1989 | -0.995 | 0.319 | 0.0018 |
| Span*1965 - 1989 | 0.185 | 0.032 | <.0001 |
| | | | |
| Chi-square | 2689.859 | | |

Table 4: Event history models of the founding of shoe manufacturing companies in the United States, 1940 - 1989

| Variable | Coefficient | SE | Probability | Coefficient | SE | Probability |
|---|---|---|---|---|---|---|
| Intercept | -7.201 | 0.441 | <.0001 | -6.965 | 0.443 | <.0001 |
| Production | 0.127 | 0.079 | 0.1066 | 0.154 | 0.080 | 0.0531 |
| Consumer spending | -0.414 | 0.054 | <.0001 | -0.458 | 0.055 | <.0001 |
| Exports | 1.689 | 0.124 | <.0001 | 1.370 | 0.135 | <.0001 |
| World War 2 | -0.890 | 0.116 | <.0001 | -0.887 | 0.118 | <.0001 |
| Number of plants$^{-1}$ | 2.888 | 0.383 | <.0001 | 2.889 | 0.383 | <.0001 |
| Average size (log) | 0.660 | 0.077 | <.0001 | 0.660 | 0.077 | <.0001 |
| Average size$^2$ (log) | -0.070 | 0.007 | <.0001 | -0.070 | 0.007 | <.0001 |
| Output data missing | 2.612 | 0.220 | <.0001 | 2.614 | 0.220 | <.0001 |
| Degree of specialization (Span) | -0.149 | 0.020 | <.0001 | -0.150 | 0.020 | <.0001 |
| Imports | 0.712 | 0.169 | <.0001 | 0.798 | 0.170 | <.0001 |
| Imports$^2$ | -0.064 | 0.017 | 0.0001 | -0.071 | 0.017 | <.0001 |
| Density | -0.006 | 0.050 | 0.9085 | -0.044 | 0.050 | 0.3783 |
| Density$^2$ | 0.029 | 0.073 | 0.6939 | 0.162 | 0.075 | 0.0311 |
| 1965 - 1989 | 2.495 | 0.597 | <.0001 | 2.495 | 0.597 | <.0001 |
| Mortality rate | | | | -0.005 | 0.001 | <.0001 |
| Plants*1965 – 1989 | -1.794 | 0.495 | 0.0003 | -1.798 | 0.495 | 0.0003 |
| Average size*1965 – 1989 | -0.302 | 0.125 | 0.0154 | -0.299 | 0.125 | 0.0168 |
| Average size$^2$*1965 – 1989 | 0.030 | 0.011 | 0.0080 | 0.029 | 0.011 | 0.0087 |
| Output data missing*1965 – 1989 | -0.645 | 0.341 | 0.0588 | -0.626 | 0.341 | 0.0668 |
| Span*1965 - 1989 | -0.058 | 0.036 | 0.1080 | -0.058 | 0.036 | 0.1095 |
| | | | | | | |
| Chi-square | 1976.475 | | | 2022.162 | | |

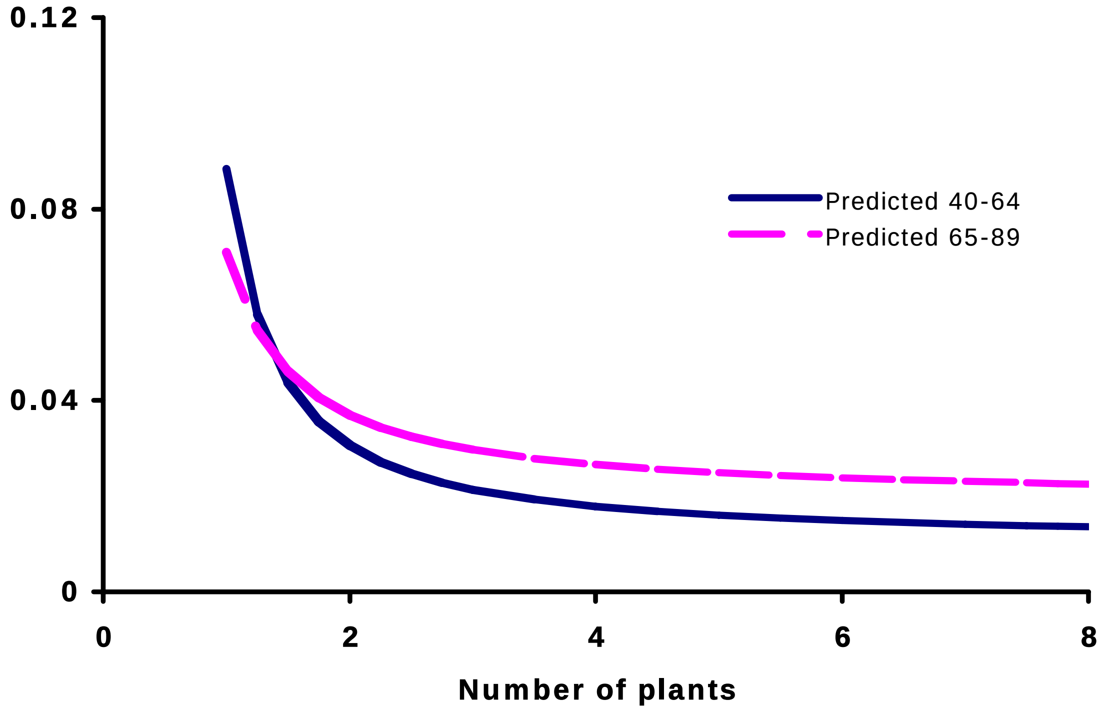


Figure 1. Mortality of shoe factories by number of plants owned by the manufacturing company, United States1940 – 1989

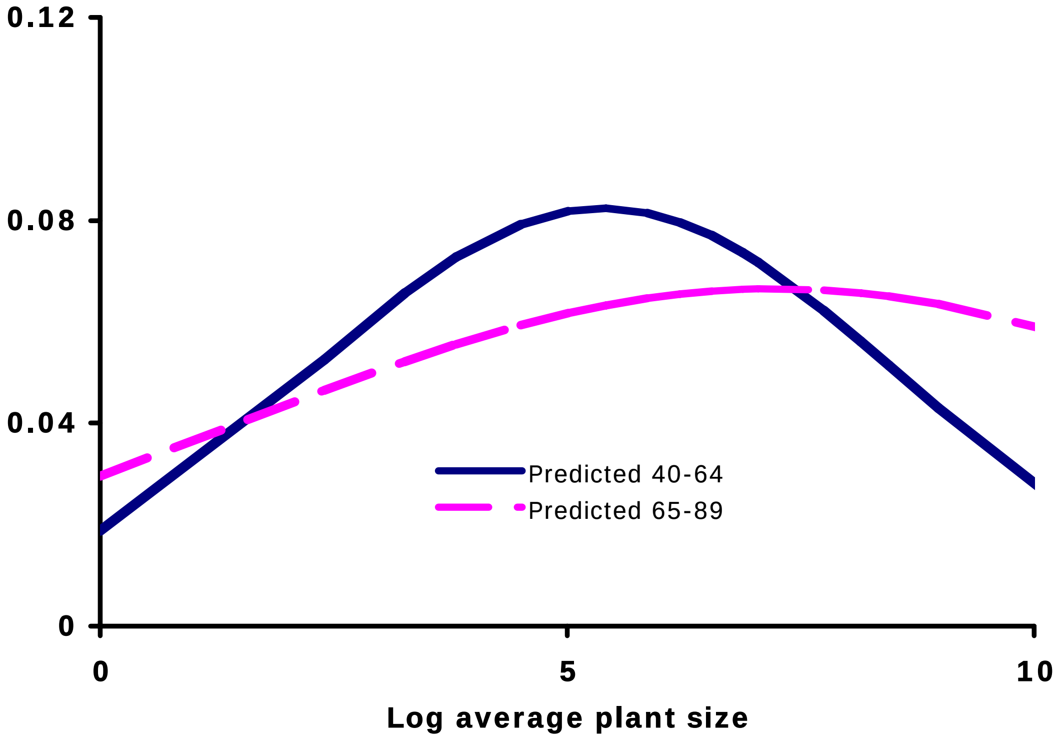


Figure 2. Mortality of shoe factories by average plant size of the manufacturing company: United States 1940 – 1989

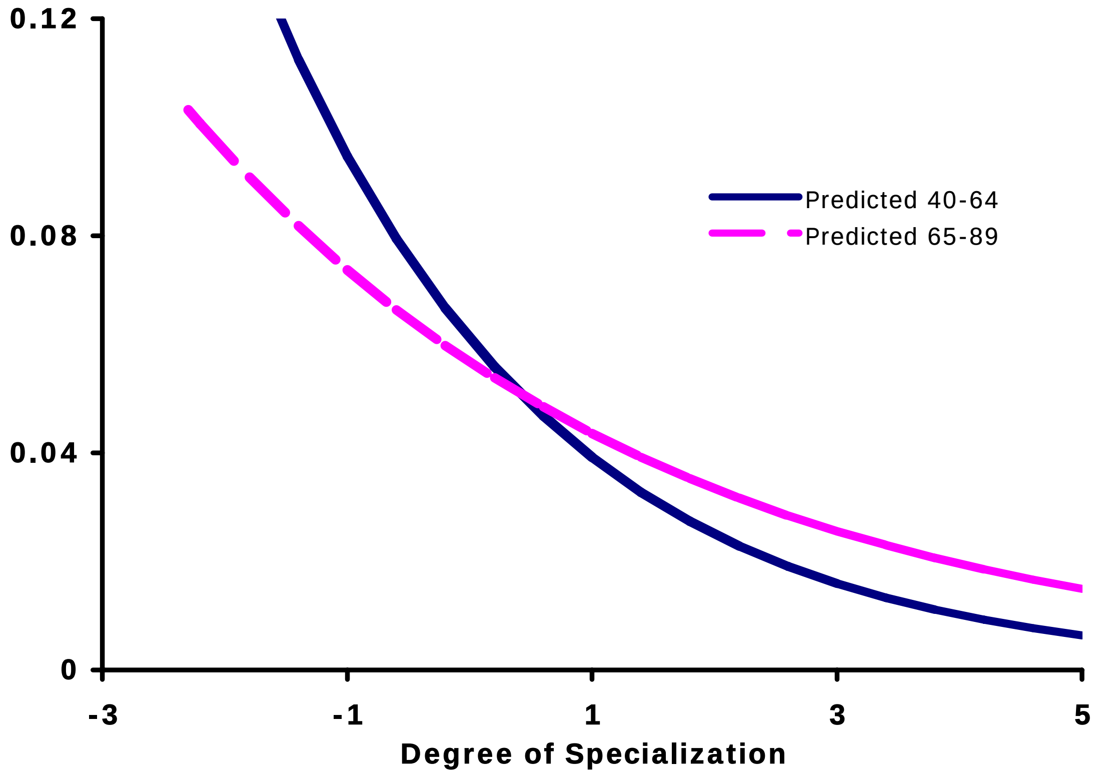


Figure 3. Mortality of shoe factories by degree of specialization of the manufacturing company: United States 1940 – 1989

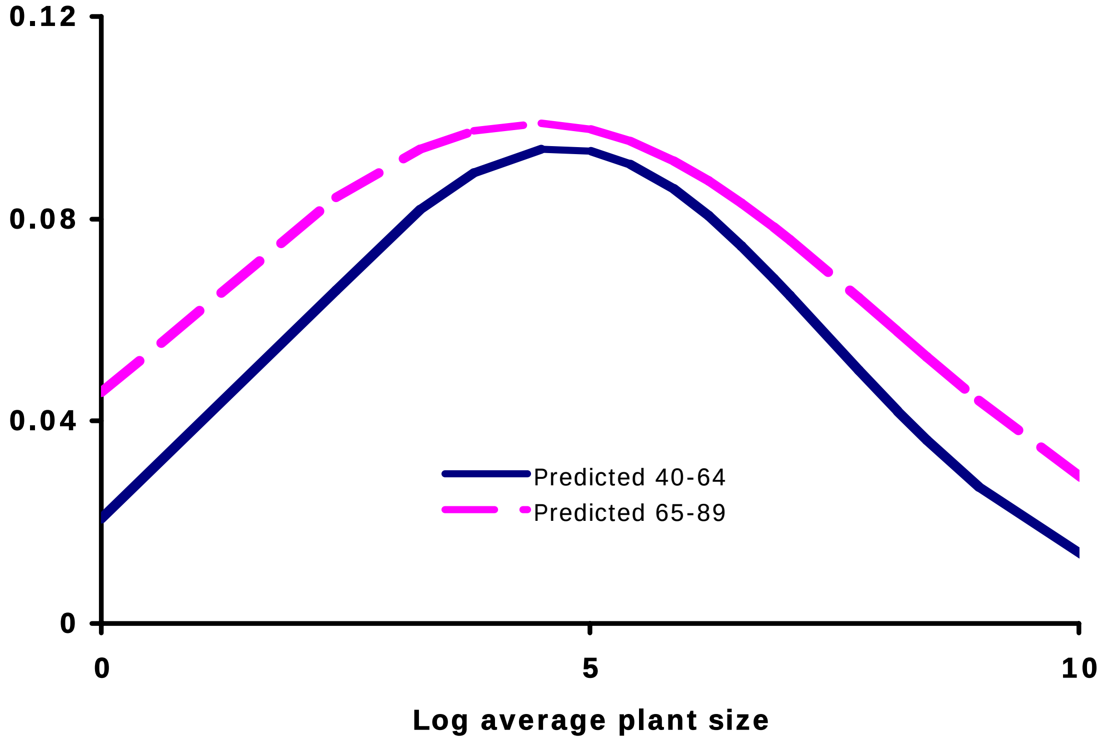


Figure 4. Rate of founding shoe factories by average plant size of manufacturing company: United States 1940 – 1989

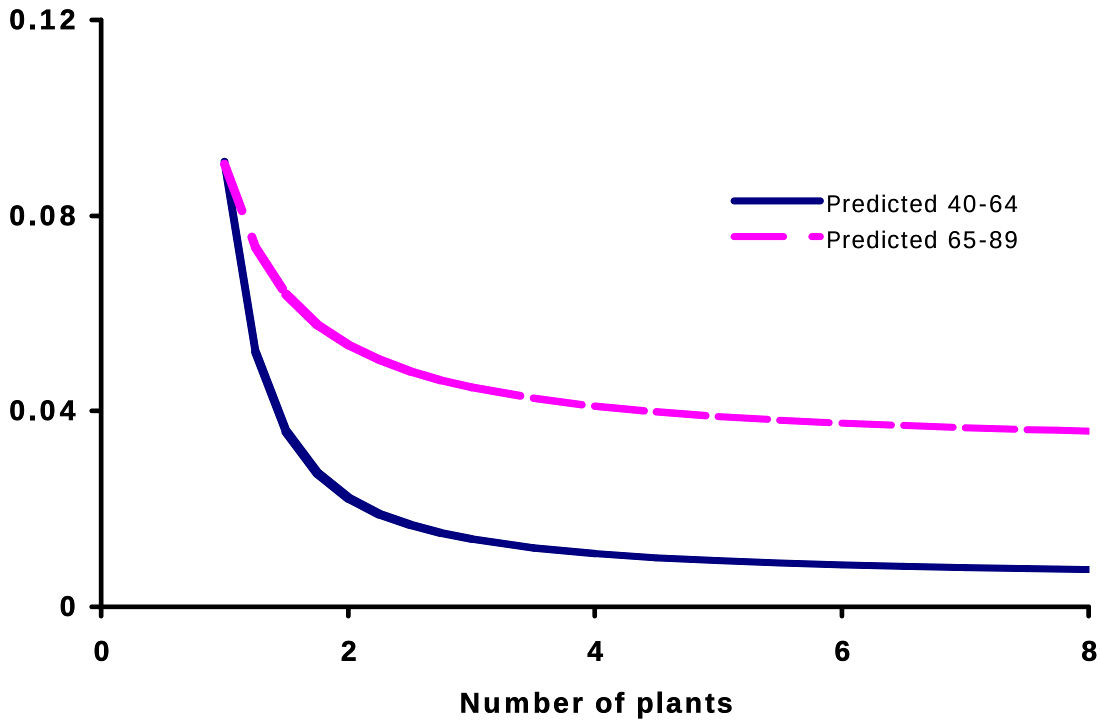


Figure 6. Rate of founding shoe factories by number of plants in manufacturing company: United States 1940 – 1989

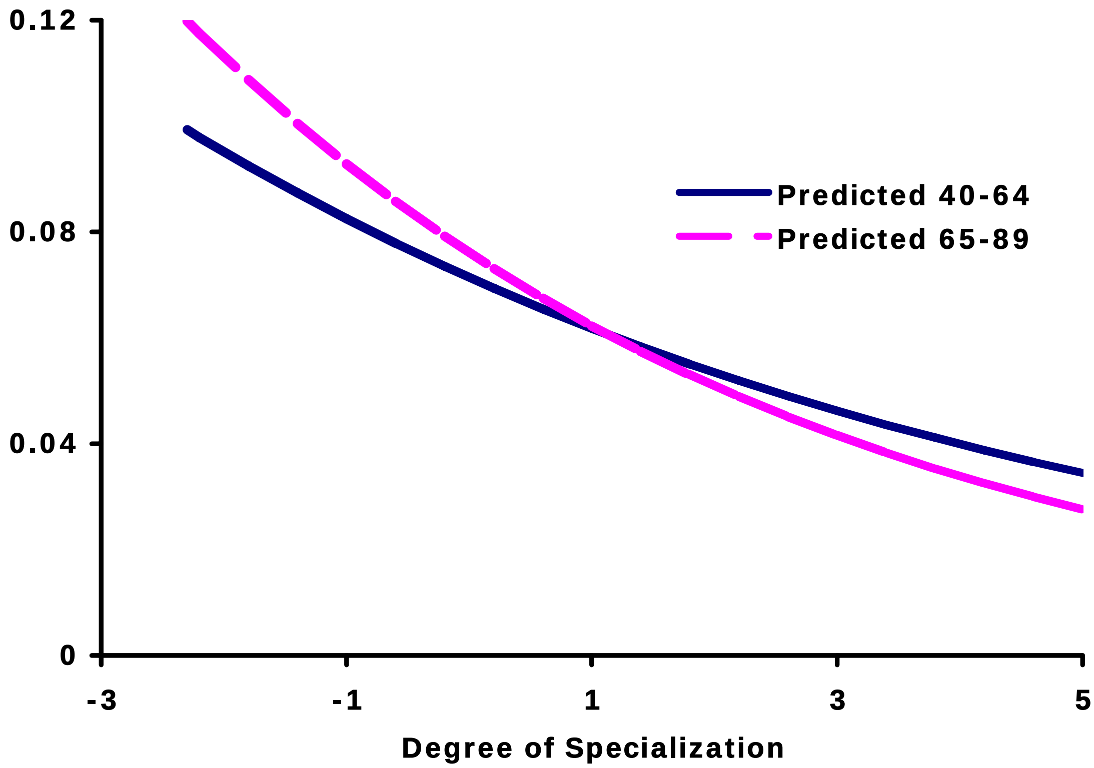


Figure 6. Rate of founding shoe factories by degree of specialization of manufacturing company: United States 1940 - 1989