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Patterns of firm entry and exit in U.S. manufacturing industries

Timothy Dunne*

Mark J. Roberts*

and

Larry Samuelson*

This article summarizes the patterns of firm entry, growth, and exit in the four-digit U.S. manufacturing industries over the period 1963–1982. Entrants are disaggregated into new firms, existing firms that diversify into an industry by opening new production facilities, and existing firms that enter by altering the mix of outputs they produce in their existing plants. We examine the relative importance of different types of entrants, the persistence of industry entry and exit patterns over time, the correlation between industry entry and exit rates, and the postentry performance of entrants.

1. Introduction

■ The importance of firm entry and exit as determinants of market performance is well recognized. Theoretical studies have examined the implications of actual, potential, and strategically deterred entry. Empirical studies have examined correlations between variables measuring market performance and factors that can hinder the entry of new competitors. Despite wide recognition of the important role of entry and exit, surprisingly little is known about the actual patterns of firm entry and exit in the U.S. economy. We address this omission by providing summary measures of the patterns of entry, growth, and exit of firms in U.S. manufacturing industries over the period 1963–1982.

Our goal is to provide stylized facts on which to base future theoretical and empirical work. To accomplish this we use a new data set that has been constructed from the individual plant-level data collected in the last five Censuses of Manufactures. This data set covers all firms producing in each four-digit manufacturing industry in the census years, 1963, 1967, 1972, 1977, and 1982. The data allow us to identify the entrants in each industry, to compare

* Pennsylvania State University.

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them with the incumbent firms, and to track their subsequent growth or exit over time. As a result, we can describe the life cycle of an entrant and measure the long-term impact of entry on industry structure in more detail than has previously been possible.

The empirical results we present focus on three aspects of the entry and exit process for which current knowledge is especially incomplete. First, we identify three distinct types of entrants and assess their relative importance in terms of both numbers and size. Second, we examine the persistence of industry entry and exit patterns over time and the correlation between industry entry and exit rates. Third, we assess the postentry performance of the new entrants by examining their market shares, average size, and failure rates as they age.

Each of these three elements has potentially important implications. First, because many firms simultaneously operate in a number of industries, it is important to recognize several possible types of entry. We distinguish the entry of new firms from the entry of existing firms into new industries through diversification. In addition, we classify diversifying firm entrants by whether they enter by opening new production facilities or by altering the mix of products they make in their existing plants. It is likely that both the fixed and sunk costs incurred by a new producer will vary across the three entrant types. As a result, their entry and exit patterns, and hence their ultimate impact on market structure, may systematically differ. For example, the empirical results reveal large numbers of entrants and exiters that are substantially smaller than existing or continuing producers. The vast majority of these entrants are new firms, but diversifying firm entrants are larger and account for almost half of entrant output.

Second, we find substantial and persistent differences in entry and exit rates across industries. Entry and exit rates at a point in time are also highly correlated across industries so that industries with higher than average entry rates tend to also have higher than average exit rates. Together these suggest that industry-specific factors play an important role in determining entry and exit patterns. Further work to distinguish industries by basic demand and cost conditions, such as the degree of sunk costs, magnitude of learning effects, extent of consumer information about the products, economies of joint production, and extent of technical change, may have a large payoff in understanding differences across industries.

Third, the long-run impact of entry on market structure depends on the postentry growth and exit of the new firms. Comprehensive evidence on these factors has generally not been available. The empirical results we report reveal a large number of exits, with small, young firms having the highest failure rates. Both the probability of survival and the size of surviving firms vary significantly across the three entrant types. This reinforces the conclusion that the heterogeneity of entrants is a factor that must be more systematically explored in future theoretical and empirical work.

The remainder of this article is organized as follows. The next section provides an overview of the data set and discusses its strengths and weaknesses for measuring entry and exit patterns. Section 3 examines the average entry and exit rates, output shares, and average sizes of entering and exiting firms between each pair of census years. We summarize the distribution of the entry and exit variables across industries and the correlations between entry and exit patterns in Section 4. Section 5 focuses on the longitudinal aspects of entry and exit by summarizing the firms' postentry market shares, average sizes, and failure rates. The final section discusses conclusions and implications for future research.

2. Measuring firm entry and exit with Census of Manufactures data

■ Empirical work on firm entry and exit has lagged behind theoretical developments partly owing to the difficulty of collecting the comprehensive data needed to quantify patterns of firm turnover. Until very recently, studies of firm or industry evolution generally adopted one of two approaches. The first relies on the use of published industry-level census data to examine the relationship between an industry's structural characteristics and the extent of entry (McGuckin, 1972; Orr, 1974; Deutsch, 1975; Gorecki, 1975, 1976). The limitation

of this data source is that only the net change in the number of firms in an industry can be measured rather than the gross flows of entrants or exits. The second approach relies on more detailed firm-level data. Studies in this vein, which are generally limited to specific industries or geographic markets or a subset of the entrants to an industry, usually focus on the firm or market characteristics that influence individual firms' entry decisions.[1]

Data sets have recently been constructed for several countries that allow the measurement of gross entry and exit for a large number of industries. These data sets are analyzed in Hause and DuRietz (1984), Beesley and Hamilton (1984), Hamilton (1985), MacDonald (1986), Baldwin and Gorecki (1987a, 1987b), Shapiro and Khemani (1987), Highfield and Smiley (1987), and Schwalbach (1987).[2] Several of these articles have examined both the market shares and numbers of entering and exiting firms. Others have allowed for entrant heterogeneity by distinguishing new and diversifying firms.[3]

While these studies have made substantial progress in measuring entry and exit patterns in a wide range of industries, most work has focused on the relationship between structural characteristics of an industry and the degree of entry and exit. The persistence of an industry's entry and exit patterns over time, the relationship between entry and exit in an industry at a point in time, and the postentry performance of new firms in terms of their ability to survive and grow have received little attention, however. This study uses a new data set, constructed from the individual plant-level data collected by the U.S. Census Bureau during the last five Censuses of Manufactures, to address these issues. The censuses cover the years 1963, 1967, 1972, 1977, and 1982.[4]

The remainder of this section is divided into three parts. First, we discuss the ability of the Census of Manufactures data to satisfy a number of desirable criteria for an entry and exit data set. Second, we summarize the construction of the firm-level entry and exit data set from the Census of Manufactures data. Finally, we define the summary measures of entry and exit that we shall examine in the remainder of the article.

□ **Data requirements.** Interest in firm entry and exit ultimately focuses on their impact on a market. It is therefore desirable that firm entry and exit measures apply to individual markets rather than aggregate across markets. In this research we treat the four-digit Standard Industrial Classification (SIC) industries as separate markets.[5]

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[1] A sampling of these studies include Peltzman (1965), Biggadike (1979), Masson and Shaanan (1982), Hannan (1983), Carlton (1983), and Lieberman (1987a, 1987b, 1987c). Geroski and Masson (1987) and Schmalensee (forthcoming) survey the empirical evidence on the determinants of entry.

[2] Hause and DuRietz (1984) examine 39 Swedish manufacturing industries over the period 1953–1968. Hamilton (1985) and Beesley and Hamilton (1984) use data on 57 Scottish manufacturing industries over the 1976–1980 period. Baldwin and Gorecki (1987a, 1987b) and Shapiro and Khemani (1987) have comprehensive data for 141 Canadian manufacturing industries in the 1970s. Highfield and Smiley (1987) and MacDonald (1976) rely on U.S. data collected by Dun and Bradstreet over the period 1976–1982. Highfield and Smiley use 40 four-digit industries, most in manufacturing, while MacDonald examines 46 food-processing industries. Schwalbach (1987) uses data on 122 four-digit manufacturing industries in Germany for the years 1977–1982.

[3] A related line of research in the labor literature has examined the gross flows of employment resulting from the entry, expansion, contraction, and closing of individual plants. These are discussed in Dunne, Roberts, and Samuelson (forthcoming).

[4] The Census of Manufactures is a complete enumeration of all manufacturing plants that had one or more persons employed at any time during the census year. Plants are identified for inclusion in the census when they begin paying Social Security tax on their employees. The plant is the basic unit of observation, and all firms that operate more than one plant are required to file separate reports for each plant. Each of the censuses from 1963 to 1982 contains between 300,000 and 350,000 manufacturing plants.

[5] The inadequacies of four-digit SIC industries as measures of economic markets are well known. See Scherer (1980, pp. 59–63) for a discussion. If interest focuses on a single industry, it is often possible to define the relevant product or geographic market more accurately. When attempting to quantify entry or exit patterns across a wide range of manufacturing industries, however, there is no practical alternative to relying on the SIC classification system. There are 448 four-digit manufacturing industries. In the analysis below we delete the 17 industries that contain "not elsewhere classified" products because of their imprecise industry definitions. We delete an additional 44 four-digit industries for reasons described in footnote 9.

Because industries differ substantially in their structural characteristics, an understanding of the pattern of industry evolution requires information on a broad cross section of industries. The Census of Manufactures is one of the few data sources containing the desired degree of cross sectional coverage. The data allow us to quantify entry and exit patterns for 387 four-digit manufacturing industries over a 20-year period.

To assess the long-term impact of firm turnover on industry structure, we must trace the growth and exit of new firms following their entry. This requires time-series data on the individual producers within each industry. While past Censuses of Manufactures were not collected with the goal of following individual plants or firms over time, substantial effort has recently been devoted to matching the individual plant observations across the last five censuses. The result is a panel data set covering the plants in the manufacturing sector in each of the last five census years. This underlying plant-level panel data set is aggregated to the firm level and used to examine firm entry, growth, and exit over time.[6]

When studying entry and exit patterns, one must recognize that many firms are multiproduct producers that operate simultaneously in several markets. Entry and exit can occur as existing firms change the set of industries in which they operate. To measure the extent of firm entry and exit correctly we must identify the entire set of industries in which each firm operates and observe how the set changes over time. The Census of Manufactures identifies which of the more than 13,000 seven-digit products are manufactured in each plant. This allows identification of the complete set of four-digit industries in which each plant operates and allows us to recognize that existing single-plant, as well as multiplant, firms can operate in more than one industry and thus be entrants into new industries.[7]

The effect of entrants on an industry may depend upon their size as well as numbers. The census collects the value of production of each seven-digit product manufactured in each plant. This makes it possible to identify the size or market share of each plant and firm in each industry in which it operates.

An entry and exit data set should allow the key characteristics of an entering firm to be identified. This is useful because the implications for industry competition may vary with the type of entrant if different types of entrants have different initial sizes or differ in their postentry performance. The census data allow us to separate entrants into new and diversifying firms. It is also possible to separate entrants into firms that enter by building new plants, by buying production facilities from existing producers, or by altering the mix of products manufactured in their existing plants. This last type of entry has not been measured in previous studies.

Finally, an important aspect of any entry data set is that it be possible to identify sales of assets or mergers between firms. The number of independent decisionmakers and their size distribution are the key structural characteristics of an industry. It is desirable to separate transactions that simply result in a change in the name of the firm owning the production facilities from transactions that change the number or size distribution of competitors. Only the latter should be counted as entry and exit. The plant-level panel data set constructed from the Census of Manufactures allows us to identify many of these ownership changes and to avoid measuring them as entry and exit. For example, conglomerate mergers will be treated as ownership changes. If, after the merger, the new owner closed a plant or

[6] Most of the gross entry and exit studies cited above use data from two points in time. This allows the identification of one group of entrants and one group of exiters, but does not allow entering firms or cohorts to be observed after entry.

[7] Other studies relying on census data always assign all of a plant's production to the single four-digit industry that accounts for the largest proportion of the value of the plant's shipments. In effect, each plant is treated as producing a single four-digit product. This can lead to upward bias in the entry and exit figures if the relative levels of the outputs produced in the plant change and this results in the plant's being reclassified into a different four-digit industry.

otherwise withdrew from an industry, this would result in exit. Horizontal mergers between two firms in the same industry will be classified as the exit of an existing firm and the growth of a continuing firm, rather than as the exit of two firms and the entry of a new one.[8]

□ **Data construction.** Dunne and Roberts (1986) discuss in detail the construction of the firm-level entry and exit data set. The construction involves the following four main steps: (1) standardization of industry definitions across the five census years; (2) matching of individual plants across the five census years; (3) aggregation of plant data to the firm level and identification of all industries in which each firm produces; and (4) identification of entering and exiting firms in each industry in each census year.

The first step is necessary because of a major revision of the SIC industries in 1972. To define industries consistently over time, we have reclassified each seven-digit product in the 1963 and 1967 censuses into the proper four-digit industry by using the 1972 industry definitions. Each four-digit industry thus consistently aggregates over the same set of seven-digit products for the entire 1963–1982 period.[9]

The second step, matching individual plants across the five census years, involves comparing plant identification numbers across adjacent census years.[10] During data collection we attempted to maintain the same identification numbers over time for plants that did not undergo ownership changes. But administrative changes, such as sale of the plant or legal reorganizations, could sometimes lead to a change in the plant's identification number. These changes could result in a failure to identify a plant that continued in operation across census years and this would then lead to an overstatement of the degree of entry and exit. For reasons discussed in detail in Dunne and Roberts (1986), these matching errors will be concentrated among the small plants that are owned by single-plant firms, but will generally not occur for larger plants.[11] The implication of this for the entry and exit patterns

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[8] While this definition of entry corresponds closely to the traditional emphasis on the number and relative size of producers in a market as the crucial elements of market structure, it does not imply that ownership changes are uninteresting economic activities. In their study of entry and exit, Baldwin and Gorecki (1987a, 1987b) separately identify the extent of changes in the ownership of existing facilities. This is particularly useful for examining the extent of merger activity.

[9] We found errors in the seven-digit product codes for 1963 and 1967 for many of the products assigned to the two-digit sectors SIC 38 (instruments) and SIC 39 (miscellaneous manufacturing). As a result, we could not consistently define 44 of the four-digit industries in sectors 38 and 39 across the five censuses. Unless specifically noted, these 44 industries are deleted from the analysis below. This leaves a total of 387 four-digit industries that are consistently defined over the twenty-year period.

[10] The matching process was undertaken in several stages. The 1972 and 1977 plants were matched as part of the construction of the Longitudinal Establishment Data (LED) file. See Monahan (1984) and Monahan and Roberts (1986) for discussion of the LED file. The matching was extended to the 1982 census by the Census Bureau staff. The 1963 and 1967 censuses were added as part of this research project. In total there are 819,631 different plants present in the five Census of Manufactures. Of these, 414,491 plants appear in only one census year. This represents 50.57% of all plants. The remaining 405,140 plants (49.43%) exist in at least two separate censuses. The percentages of plants in each of the five census years that appear in at least one other census are 69.0, 84.0, 81.7, 77.9 and 60.8 for the years 1963, 1967, 1972, 1977, and 1982, respectively. The percentages are lower for 1963 and 1982 because they are the endpoints of the time period. Many of the plants that appear only in the 1963 census would also appear in the 1958 census, and similarly, many of the plants unique to 1982 will appear in the 1987 census.

[11] The ability to track large plants—those with more than 250 employees—accurately over time is improved because an additional plant identification number, which is unaffected by changes in plant ownership, is reported for these plants. This identification number is assigned to large plants because they are always included in the sample of plants canvassed in *The Annual Survey of Manufactures*. The ASM collects data for a sample of approximately 70,000 manufacturing plants in all non-Census of Manufactures years. In addition to large plants, in the 1963 through 1977 censuses all plants owned by multiplant firms, regardless of size, were included in the ASM sample and were assigned an ASM identification number. For these plants, which alone account for approximately 85% of the value of manufacturing output, matching across census years will be quite accurate, regardless of ownership changes.

presented below is that measurement error will have a larger effect on the firm entry and exit rates than on the market shares of entering or exiting firms.

To reduce the effect of measurement error on the findings, we delete the smallest firms in each industry, with the number of small firms deleted from each industry chosen so that they together produce 1% of the industry's output. We do this to exclude the extremely small firms, many of which are one-employee firms, where matching errors are most likely. Unless otherwise indicated, the summary measures presented below pertain to the firms responsible for 99% of each industry's output.[12]

In the third step we construct firm-level data on the value-of-production in each four-digit industry by aggregating over all plants owned by a firm in each census. Table 1 provides a summary of the number of firms present in the manufacturing sector in each census year and the average number of four-digit industries per firm. There are approximately 265,000 firms present in each of the first three years and 295,000 in the last two censuses. When these are disaggregated into single and multiplant firms, we see that, on average, single-plant firms account for 93.4% of the total number of firms in each year, but only 17.1% of the value of production. Multiplant firms, on average, own 3.59 plants and produce in 2.64 different four-digit industries, while single-plant firms produce in 1.14 industries.

Two trends over time are useful to note. First, there is a steady decline in the average number of four-digit industries per firm for both single- and multiplant firms. Because we treat firms as multiproduct producers, this will result in rates of firm exit that are higher than those reported in studies that treat firms as making only a single product. Second, there is a substantial increase in the number of multiplant firms over time. From 1963 to 1982 the total number of multiplant firms increased from 14,691 to 21,632, an increase of 47.2%. Over the same period the number of single-plant firms increased by only 8.6%. Again, because firms are treated as multiproduct producers, this trend will be reflected in higher rates of entry relative to studies that treat firms as producing only a single output.

The final step in the data construction is the identification of entering and exiting firms in each industry. To simplify the discussion, we shall henceforth use the term, "firm," to refer to a producer in a four-digit industry. We shall thus count multiproduct producers as a firm in each industry in which they have output. When a firm appears in an industry for the first time, we construct three characteristics of the entrant. The first is the year of entry, the census year in which the firm first appears.[13] The second is the entrant's type, whether

TABLE 1 Summary Data for Manufacturing Firms in Each Census Year

	Total Firms		Single-Plant Firms			Multiplant Firms			
Census Year	Number of Firms	Average Number of Four-Digit Industries per Firm	Share of Number of Firms	Share of Total Value of Production	Average Number of Four-Digit Industries per Firm	Share of Number of Firms	Share of Total Value of Production	Average Number of Four-Digit Industries per Firm	Average Number of Plants per Firm
1963	265,779	1.31	.945	.215	1.23	.055	.785	2.75	3.72
1967	265,599	1.24	.942	.194	1.15	.058	.806	2.69	3.59
1972	263,169	1.25	.926	.146	1.13	.074	.854	2.70	3.54
1977	295,687	1.23	.928	.150	1.12	.072	.850	2.55	3.59
1982	294,394	1.22	.927	.152	1.08	.073	.848	2.52	3.50

[12] The 1% cutoff guarantees that the analysis still includes virtually all industry output. It is also helpful when making across industry comparisons because it results in the same degree of output coverage across industries. A fixed firm-size cutoff would result in very different degrees of coverage across industries.

[13] We classify a firm that exists an industry in one census and then reenters the same industry in a later census year as an exiter when it leaves and as an entrant in the year it reenters.

the entrant is a new or diversifying firm. A new firm is one that was not present in any manufacturing industry in the previous census. Diversifying firms are those that produced in a different four-digit manufacturing industry in the previous census year. The third characteristic is the entry method. This classifies entrants by whether they entered the industry through new plant construction or by changing the mix of products made in their existing plants.[14] Hence, we classify each entrant into an industry by entry date, by whether the firm is new or diversifying, and by the method of entry.[15]

To summarize, the entry and exit data set we have constructed from Census of Manufactures data provides coverage of firms responsible for 99% of output in each of 387 four-digit manufacturing industries. The 20-year period available for study is long enough that we can observe a complete cycle of entry, growth, and exit for a large number of firms. The multiple observations over the period allow us to observe the postentry performance of entrants. The availability of output data on each of a plant's multiple products is extremely valuable in examining both the relative sizes of entering and exiting firms and the importance of entry through changes in an existing firm's product mix. Finally, to a large extent we can separate firm entry and exit from ownership changes that do not affect the number or size distribution of competitors in the industry.

The data are not without weaknessess. First, the manufacturing census is only taken at five-year intervals, and it is accordingly not possible to identify firms that enter and exit between adjoining census years. Estimates of entry and exit rates constructed from five-year census data will thus underestimate the year-to-year turnover.[16] Second, entry and exit rates for the 1963–1967 period cover only four years, while the other time periods are five years long. Because we shall generally report results for each of the four time periods, we do not correct for this difference. Third, we cannot identify the entry year or type and method of entry for firms that appear in the 1963 census. Fourth, there is the possibility of measurement error resulting from the fact that ownership changes can lead to errors in matching small plants, particularly those owned by single-plant firms, across census years. Finally, extremely small plants are handled differently in the data-collection process.[17] Each of these small plants is treated as a single-product producer. The Census Bureau has increased the number of plants in this category in each census year since 1967. This administrative change could result in a slight increase in exit rates, although, because of the small size of the plants involved, there will be no significant effect on the market share of exiting firms.

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[14] We use the term, "new plant construction," to refer to both newly built plants and previously existing plants that have just been brought into production in this industry. For example, a firm that enters an industry by renting or purchasing an existing building and setting up a manufacturing operation in the facility would be classified as entering through new-plant construction. The data set also identifies firms that enter by acquiring a plant from an existing firm. For these plant acquisitions to result in entry, we require that the selling firm remain in the industry. If the selling firm exits the industry, we classify the transaction as an ownership change and do not treat it as the exit of an existing firm and entry of a new firm. See Dunne and Roberts (1986) for details. MacDonald (1986) uses a very similar definition of entry and exit. The number of firms entering an industry through the acquisition of existing facilities is extremely small. The entry rate in this category is less than .5% in all periods and these firms never account for more than 1.2% of industry output in any year. Because of their small numbers, they have been aggregated with firms that enter through new-plant construction for our analysis.

[15] Only three of the four combinations of entry type and method can be observed. It is not possible for new firms to enter an industry by diversifying the mix of products they produce in their previously existing plants because they do not have previously existing plants.

[16] *The Annual Survey of Manufactures* is not useful for correcting this problem because it is weighted toward larger plants and plants owned by multiplant firms, and thus is not representative of the population of entrants. In addition, it does not collect output data at the seven-digit level, and this prevents us from establishing consistent industry definitions for each year over the twenty-year period.

[17] The definition of small varies across industries and time, but generally includes all plants with less than five employees. From 1967 onward, most data for these small plants have been imputed from other government sources, whereas larger plants are surveyed directly.

□ **Entry and exit measures.** We construct summary measures of both the number of entrants and exiters as well as their size relative to other firms in the industry. The following discussion can be made more precise by defining the following variables:

$NE_i(t)$ = number of firms that enter industry i between census years $t-1$ and t;
$NT_i(t)$ = total number of firms in industry i in census year t. This includes firms that enter industry i between census years $t-1$ and t;
$NX_i(t-1)$ = number of firms that exit industry i between census years $t-1$ and t;
$QE_i(t)$ = total output of firms that enter industry i between census years $t-1$ and t.
$QT_i(t)$ = total output of all firms in industry i in census year t;
$QX_i(t-1)$ = total year $t-1$ output of firms that exit industry i between census years $t-1$ and t.

Using these variables, we define the entry and exit rates for industry i between census years $t-1$ and t as

$$ER_i(t) = NE_i(t)/NT_i(t-1)$$

$$XR_i(t-1) = NX_i(t-1)/NT_i(t-1).$$

Notice that the denominator in both cases is the total number of firms in the industry in year $t-1$.[18]

Because entering and exiting firms tend to be smaller than other firms, it is important to look at their contribution to industry output. We define the market shares of firms that enter or exit between census years $t-1$ and t as

$$ESH_i(t) = QE_i(t)/QT_i(t)$$

$$XSH_i(t-1) = QX_i(t-1)/QT_i(t-1).$$

These measures summarize the contribution of new firms in the first year in which they were observed and of exiting firms in the last year in which they were observed. The entrants' market share (ESH) is accordingly a proportion of year t output, while the exiters' market share (XSH) is measured relative to year $t-1$ output. Finally, we define the average size of entering firms relative to incumbents (ERS) and the average size of exiting firms relative to nonexiting firms (XRS) as

$$ERS_i(t) = \frac{QE_i(t)/NE_i(t)}{(QT_i(t) - QE_i(t))/(NT_i(t) - NE_i(t))}$$

$$XRS_i(t-1) = \frac{QX_i(t)/NX_i(t-1)}{(QT_i(t-1) - QX_i(t-1))/(NT_i(t-1) - NX_i(t-1))}.$$

These measures allow us to compare, at a point in time, the average size of entrants and incumbents and the average size of exiting and surviving firms. The denominator of $ERS(t)$ accordingly includes all firms present in census year t except the entrants, and the denominator of $XRS(t-1)$ includes all firms present in census year $t-1$ except those who exit before year t.[19]

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[18] The denominator of the exit rate is all firms in operation at the beginning of the time period, and thus represents the pool of potential exiting firms. In the case of entry the pool of potential entrants cannot be observed. The denominator of the entry rate is the number of firms in the industry in the previous period. These are the measures generally constructed in other studies of gross entry and exit and allow a basis for comparison with other work.

[19] The relative size of entering (exiting) firms is not defined unless entry (exit) actually occurs. When constructing average values across industries and years, we include only observations when entry and exit actually occur.

3. Average entry and exit statistics

■ The description of entry and exit patterns begins with the measurement of the average levels of entry and exit across four-digit industries in the manufacturing sector. Table 2 reports the values of the six entry and exit variables between each pair of census years. We present the variables for two different groups of firms. The first group consists of all firms present in the year of interest. The second group deletes the smallest firms in each industry, with the number of small firms deleted from each industry chosen so that together they produce 1% of the industry's output.

Several aspects of Table 2 are noteworthy. First, after we delete the smallest firms in each industry, the average entry rate varies from .307 to .427 across the census years. On average, 38.6% of the firms in operation in each industry in each census year were not producing in that industry in the previous census.[20] Second, the average market share of the entrants is substantially smaller than their entry rate. After we delete the smallest firms, the average market share varies from .136 to .185 across census years.[21] On average, the entrants in each year are responsible for approximately 15.8% of each manufacturing industry's output. The comparison of entry rates and entrant market shares reveals that entrants tend to be smaller than existing producers. In particular, an entrant produces, on average, 35.2% of the average output level of all incumbent firms in the industry.

The exit variables summarized in Table 2 reveal a similar pattern. A large number of firms of relatively small size leave the manufacturing industries between each pair of census years. The average industry exit rate varies from .308 to .390 between each pair of census years. The average market share of all exiting firms varies from .144 to .191, and their output level varies from .310 to .367 of the average output of nonexiting firms.[22]

TABLE 2 **Entry and Exit Variables for the U.S. Manufacturing Sector (Averages over 387 Four-Digit SIC Industries)**

	1963–1967	1967–1972	1972–1977	1977–1982
Entry Rate (*ER*):				
All firms	.414	.516	.518	.517
Smallest firms deleted	.307	.427	.401	.408
Entrant Market Share (*ESH*):				
All firms	.139	.188	.146	.173
Smallest firms deleted	.136	.185	.142	.169
Entrant Relative Size (*ERS*):				
All firms	.271	.286	.205	.228
Smallest firms deleted	.369	.359	.280	.324
Exit Rate (*XR*):				
All firms	.417	.490	.450	.500
Smallest firms deleted	.308	.390	.338	.372
Exiter Market Share (*XSH*):				
All firms	.148	.195	.150	.178
Smallest firms deleted	.144	.191	.146	.173
Exiter Relative Size (*XRS*):				
All firms	.247	.271	.221	.226
Smallest firms deleted	.367	.367	.310	.344

[20] When we include the smallest firms in each industry, the entry rate increases by approximately 10 percentage points in each year.

[21] The market share of all entering firms varies from .139 to .188 over time. It falls by approximately .4 percentage points when the smallest firms are deleted. This indicates that entrants account for approximately 55% of the industry output, which is deleted when small firms are excluded.

[22] When all firms are included, the exit rate increases by approximately 11 percentage points in each year, but the market share increases by only .4 percentage points.

It is useful to examine both entrants and exiters more closely. Table 3 presents the average entry variables for three different categories of entrants: new firms entering through the construction of a new plant (*NF/NP*), diversifying firms entering through the construction of a new plant (*DF/NP*), and diversifying firms entering through changes in the mix of outputs they produce in their existing plants (*DF/PM*). On average, over the four time periods, new-firm, new-plant entrants account for approximately 55.4% of the total number of entrants in each industry. Diversifying-firm, new-plant entrants account for approximately 8.5% of each industry's entrants, and diversifying-firm, product-mix entrants for the remaining 36.1%. When we examine entrants' market shares, however, the relative importance of new-firm entrants is reduced. On average, new-firm, new-plant, diversifying-firm, new-plant, and diversifying-firm, product-mix entrants are respectively responsible for 50.0, 14.4, and 35.6% of total entrant output. On average, diversifying firms thus account for approximately 44.6% of the number of entrants in each industry, but 50.0% of the output of the entering firms. This difference is consistent with the observation that new-firm entrants in each industry are on average 28.4% as large as existing producers, while diversifying-firm, new-plant entrants are 87.1% and diversifying-firm, product-mix firms are 34.9% as large.

We disaggregate the exit variables by type of firm and method of firm entry in Table 4. Because firms in the 1963 Census cannot be classified by type or method of entry, we report them as a separate category.[23] Producers that entered as new firms by constructing new plants are the most substantial group of exiting firms in terms of both numbers and market share. The group of diversifying firms that entered by constructing new plants have both a smaller number of exits and smaller exit market share than the other entrant types. This reflects the fact that there are both a smaller number of these firms and, as we shall show below, a higher proportion that survive over time. The average size of the exiting firms follows the same pattern as the average size of entering firms. Diversifying-firm, new-plant

TABLE 3 **Entry Variables by Type of Firm and Method of Entry (Averages over 387 Four-Digit SIC Industries)**

Type of Firm/ Method of Entry*	1963–1967	1967–1972	1972–1977	1977–1982
Entry Rate				
Total	.307	.427	.401	.408
NF/NP	.154	.250	.228	.228
DF/NP	.028	.053	.026	.025
DF/PM	.125	.123	.146	.154
Entrant Market Share				
Total	.136	.185	.142	.169
NF/NP	.060	.097	.069	.093
DF/NP	.019	.039	.015	.020
DF/PM	.057	.050	.058	.057
Entrant Relative Size				
Total	.369	.359	.280	.324
NF/NP	.288	.308	.227	.311
DF/NP	.980	.919	.689	.896
DF/PM	.406	.346	.344	.298

* *NF/NP* = new-firm, new-plant; *DP/NP* = diversifying-firm, new-plant; *DF/PM* = diversifying-firm, product-mix.

[23] The exit rate and exiting-firm market share for the 1963 firms declines over time. This occurs because, while the number of these firms cannot increase over time, the number of firms with which they are being compared is the sum over all subsequent cohorts and thus rises over time.

entrants have the largest exiting size followed by diversifying-firm, product-mix and new-firm, new-plant entrants.

The general pattern that emerges from Tables 2, 3, and 4 is one of large numbers of entering and exiting firms that are substantially smaller on average than existing or continuing producers. By averaging across industries, we find that entering and exiting firms each account for approximately 16% of industry output, but 40% of the firms in each census year. New firm entrants are responsible for both the majority of entering and exiting firms. Their contribution to industry output is less than their numbers might indicate, because they tend to be smaller, on average, than diversifying-firm entrants. On average across industries, new firms are responsible for 50% of entrant output. Firms that enter new industries by altering the mix of outputs in their existing plants are responsible for approximately 35.6% of the total output of all entering firms.

4. Variation in industry entry and exit patterns

■ The average statistics provided in the last section do not provide information on the diversity of entry and exit patterns across industries. Table 5 provides summary measures of this diversity across four-digit industries. The three data columns in the table correspond to the rate, market share, and relative size of the entering or exiting firms. The first number in each column is the average value of the variable over the four time-period observations for all of the four-digit industries within the two-digit sector. The numbers in parentheses are the 10 and 90% deciles across the four-digit industries and years.[24]

The average entry rates across industries within a two-digit sector vary from a low of .205 in tobacco to a high of .603 in instruments. Eleven of the twenty sectors have average entry rates above .4. The variation across four-digit industries within a sector is substantial.

TABLE 4 **Exit Variables by Type of Firm and Method of Entry (Averages over 387 Four-Digit SIC Industries)**

Type of Firm/ Method of Entry	1963–1967	1967–1972	1972–1977	1977–1982
Exit Rate				
Total	.308	.390	.338	.372
1963 firms	.308	.224	.103	.082
NF/NP		.087	.134	.173
DF/NP		.011	.024	.022
DF/PM		.068	.076	.096
Exit Market Share				
Total	.144	.191	.146	.173
1963 firms	.144	.126	.056	.061
NP/NP		.032	.050	.061
DF/NP		.005	.013	.014
DF/PM		.027	.028	.038
Exit Relative Size				
Total	.367	.367	.310	.344
1963 firms	.367	.499	.506	.802
NF/NP		.312	.290	.255
DF/NP		.587	.628	.639
DF/PM		.360	.301	.322

[24] In this table we use 1972–1977 and 1977–1982 observations for the 44 four-digit industries in SIC 38 and 39 to provide coverage for these two sectors. We do not use the 1963–1967 and 1967–1972 observations for these industries because the industry definitions are not consistent with the later years. See footnote 9.

TABLE 5 **The Distribution of Entry and Exit Variables across Industries (Means and 10% and 90% Deciles (in parentheses) across Years and Four-Digit Industries Within Each Two-Digit Sector)**

Two-Digit Sector	Rate	Market Share	Relative Size
	Entry Variables		
20 Food Processing	.239 (.08, .39)	.098 (.02, .19)	.313 (.10, .57)
21 Tobacco	.205 (.00, .63)	.021 (.00, .06)	.107 (.00, .27)
22 Textiles	.372 (.17, .60)	.177 (.05, .31)	.374 (.16, .56)
23 Apparel	.403 (.20, .65)	.262 (.11, .38)	.512 (.22, .82)
24 Lumber	.497 (.23, .90)	.264 (.09, .42)	.424 (.21, .64)
25 Furniture	.471 (.28, .69)	.239 (.13, .38)	.383 (.21, .65)
26 Paper	.314 (.07, .52)	.107 (.01, .24)	.304 (.10, .74)
27 Printing	.490 (.22, .91)	.228 (.09, .39)	.407 (.15, .71)
28 Chemicals	.325 (.12, .53)	.086 (.01, .18)	.217 (.08, .44)
29 Petroleum and Coal	.337 (.16, .58)	.140 (.02, .28)	.354 (.10, .83)
30 Rubber and Plastics	.431 (.10, .88)	.129 (.01, .26)	.224 (.06, .43)
31 Leather	.294 (.19, .48)	.186 (.06, .33)	.476 (.23, .83)
32 Stone, Clay, Glass	.344 (.13, .58)	.131 (.02, .29)	.330 (.07, .65)
33 Primary Metals	.319 (.08, .55)	.122 (.01, .26)	.328 (.10, .63)
34 Fabricated Metals	.429 (.23, .65)	.193 (.07, .35)	.376 (.15, .70)
35 Nonelectrical Machinery	.465 (.26, .66)	.167 (.06, .32)	.299 (.11, .52)
36 Electrical Machinery	.461 (.21, .78)	.095 (.03, .26)	.216 (.08, .45)
37 Transportation Equipment	.465 (.09, .73)	.141 (.01, .39)	.257 (.06, .73)
38 Instruments	.603 (.29, .88)	.189 (.06, .32)	.224 (.09, .39)
39 Miscellaneous	.402 (.21, .63)	.187 (.07, .30)	.351 (.15, .61)
	Exit Variables		
20 Food Processing	.313 (.16, .44)	.123 (.03, .23)	.303 (.11, .55)
21 Tobacco	.223 (.03, .48)	.032 (.00, .09)	.110 (.00, .25)
22 Textiles	.372 (.22, .52)	.179 (.06, .32)	.355 (.18, .55)
23 Apparel	.453 (.34, .58)	.291 (.15, .45)	.517 (.27, .77)
24 Lumber	.441 (.29, .57)	.264 (.12, .41)	.452 (.25, .71)
25 Furniture	.431 (.32, .62)	.241 (.12, .36)	.418 (.22, .63)
26 Paper	.299 (.14, .43)	.122 (.05, .24)	.324 (.13, .57)
27 Printing	.429 (.33, .58)	.243 (.11, .40)	.439 (.19, .73)
28 Chemicals	.285 (.13, .42)	.081 (.01, .17)	.213 (.08, .42)
29 Petroleum and Coal	.297 (.13, .40)	.144 (.02, .27)	.373 (.09, .74)
30 Rubber and Plastics	.302 (.09, .52)	.133 (.01, .25)	.316 (.09, .48)
31 Leather	.390 (.28, .49)	.240 (.13, .40)	.487 (.33, .77)
32 Stone, Clay, Glass	.307 (.13, .46)	.138 (.03, .29)	.357 (.08, .69)
33 Primary Metals	.277 (.10, .43)	.120 (.01, .29)	.341 (.08, .69)
34 Fabricated Metals	.355 (.21, .48)	.182 (.05, .31)	.406 (.13, .73)
35 Nonelectrical Machinery	.373 (.29, .48)	.161 (.06, .28)	.328 (.12, .55)
36 Electrical Machinery	.351 (.23, .48)	.119 (.03, .25)	.240 (.08, .45)
37 Transportation Equipment	.327 (.05, .56)	.117 (.00, .28)	.233 (.06, .50)
38 Instruments	.468 (.35, .61)	.182 (.08, .28)	.254 (.10, .39)
39 Miscellaneous	.410 (.30, .49)	.222 (.10, .34)	.430 (.19, .71)

Coverage: 387 four-digit SIC industries in 1963–1967 and 1967–1972, 431 four-digit SIC industries in 1972–1977 and 1977–1982.

Many sectors contain some relatively low-entry industries; in eight sectors the first decile is less than .15. Virtually all sectors contain some high-entry industries; the ninth decile exceeds .5 in 18 sectors.

The entrant market shares indicate that entrants generally have a smaller effect on industry output than their numbers might suggest. The averages by two-digit sectors vary from a low of .021 in tobacco to a high of .264 in lumber. In half of the two-digit sectors

the first decile is less than .03, which indicates that in at least 10% of the industry observations in these sectors entrants account for less than 3% of industry output in a census year. The high average entrant market shares that appear in a few of the sectors (apparel, lumber, furniture, and printing) appear to arise more from the larger relative size of entrants in these sectors rather than from higher entry rates.

The bottom of Table 5 reports the measures for the exit variables. The interesting pattern that is revealed is the similarity between the average entry and exit patterns across two-digit sectors. Of the six sectors with the highest exit rates, four (instruments, lumber, furniture, and printing) are the sectors with the highest average entry rates. Similarly, of the six sectors with the lowest average exit rates, four are among the six sectors with the lowest average entry rates.

This similarity in the entry and exit patterns across sectors is stronger when we examine market shares or relative sizes. The simple correlation between the average market share of entrants and the average market share of exiters in the 20 sectors is .92. The simple correlation between the sectoral average relative size of entrants and exiters is .98. Overall, Table 5 suggests that, while there is substantial variation in entry and exit patterns across both two-digit sectors and four-digit industries within a sector, there are also some systematic relationships between entry and exit at the sectoral level.

To examine the importance of industry-specific differences in the entry and exit variables, we focus on two issues. The first is the correlation of the entry (exit) variables over time. A positive time-series correlation indicates that industries with higher than average entry (exit) in any one year will tend to have higher than average entry (exit) in other years. The second issue concerns the correlation between entry and exit across industries in any census year. Do relatively high entry and exit rates occur simultaneously in the same industry?

We address the first issue in Table 6. The left side of the table reports the simple correlations for each of the three entry variables across the different census years, and the right side reports the same information for the three exit variables. Each variable is positively correlated with itself across census years, and the degree of correlation diminishes as the years become farther apart. The correlations have the highest magnitudes for the entrants' and exiters' market shares. For example, the simple correlations between the entrants'

TABLE 6 **Correlations between Industry Entry and Exit Measures across Census Years (387 Four-Digit Industries)**

	Entry Measures				Exit Measures			
	1963–1967	1967–1972	1972–1977	1977–1982	1963–1967	1967–1972	1972–1977	1977–1982
Entry Rate					Exit Rate:			
1963–1967	1.000	.310	.233	.251	1.000	.671	.594	.577
1967–1972		1.000	.274	.265		1.000	.681	.624
1972–1977			1.000	.306			1.000	.739
1977–1982				1.000				1.000
Entrant Market Share					Exiter Market Share:			
1967	1.000	.721	.697	.598	1.000	.777	.707	.649
1972		1.000	.804	.692		1.000	.778	.721
1977			1.000	.759			1.000	.787
1982				1.000				1.000
Entrant Relative Size					Exiter Relative Size:			
1967	1.000	.400	.455	.377	1.000	.569	.502	.501
1972		1.000	.610	.503		1.000	.617	.564
1977			1.000	.609			1.000	.555
1982				1.000				1.000

market shares in an industry in 1967 and the shares in 1972, 1977, and 1982 are .721, .697, and .598, respectively. These results indicate that relative differences in entry and exit patterns across industries persist over time. This, in turn, suggests that industry-specific factors that persist over time affect both entry and exit levels. Correction for these factors may then be particularly important when we examine the effect of time-varying factors, such as industry growth rates, on entry and exit patterns.

Table 7 examines the correlation between entry and exit rates across industries. The left side of Table 7 presents the simple correlations between an industry's entry and exit rate in each census year. Below these correlations are the comparable figures for entrant and exiter market shares. The correlations are all positive, which indicates that industries with higher than average entry rates (shares) also tend to have higher than average exit rates (shares). The correlations are particularly high for the market shares. The latter correlations tend to be largest when the entry and exit shares are for the same time period and diminish slightly as the time periods become farther apart. This suggests that industries tend to be characterized either by relatively high simultaneous entry and exit rates (shares) or relatively low simultaneous entry and exit rates (shares). The fact that the correlation tends to remain high even when exit and entry shares are from different time periods suggests little change over time in the relative ease of entry and exit for an industry.

The correlations in the right half of Table 7 exploit the panel nature of the data set to examine whether periods of relatively high entry in an industry are also periods of relatively high exit, or whether periods of relatively high entry are also periods of relatively low exit. To address this issue we construct correlations using entry and exit variables expressed as deviations from the industry mean over the four time periods to remove fixed industry effects. Table 7 reveals that the corrected entry and exit rates in the same time period are always negatively correlated. Periods of higher than average entry rates for an industry are thus also periods of lower than average exit rates. The correlation between the entry rate in period t and the exit rate in period $t + 1$ is positive, which indicates that higher than average entry rates in one period are followed by higher than average exit rates in the next period.

Somewhat surprisingly, this correlation pattern does not occur between entry and exit market shares. In this case the entrants' market share is positively correlated with the exiters' share after industry effects have been removed. Periods of higher than average entrant shares are thus periods of higher than average exiter shares. Since these are periods with relatively low exit rates, the exiting firms in these periods must tend to be unusually large. The positive correlation between entrant shares in period t and exiter shares in period $t + 1$ remains.

TABLE 7 Correlations between Industry Entry and Exit Variables (387 Four-Digit Industries)

	No Correction for Fixed Industry Effects				Correction for Fixed Industry Effects			
	1963–1967	1967–1972	1972–1977	1977–1982	1963–1967	1967–1972	1972–1977	1977–1982
		Entry Rate				Entry Rate		
Exit Rate								
1963–1967	.180	.363	.387	.323	−.249	.071	.123	−.005
1967–1972	.447	.274	.273	.363	.371	−.191	−.177	.118
1972–1977	.358	.408	.321	.328	.051	.137	−.129	−.081
1977–1982	.237	.324	.389	.304	−.114	−.029	.147	−.028
		Entrant Market Share				Entrant Market Share		
Exiter Market Share								
1963–1967	.741	.725	.743	.691	.308	−.116	−.037	−.167
1967–1972	.722	.770	.759	.703	.124	.154	−.058	−.228
1972–1977	.681	.800	.788	.784	−.153	.160	−.044	.032
1977–1982	.571	.691	.758	.804	−.287	−.172	.132	.354

The results of this section indicate that there is considerable dispersion in entry and exit patterns across four-digit industries, even within a two-digit sector, as well as a substantial degree of permanence to the pattern for any industry over time. Entry and exit patterns are positively correlated across industries, but can become negatively correlated when industry-specific effects are removed.

5. Longitudinal aspects of entry and exit

■ In this section we turn our attention from the cross sectional patterns of entry and exit to the longitudinal aspects of growth and exit.[25] In assessing the performance implications of entry, one must understand the degree of permanence associated with the entry. Do entrants start small and stay small or do successful entrants eventually become substantial

TABLE 8 **Market Shares, Average Firm Sizes, and Exit Rates of Entry Cohorts by Year (Means and Standard Deviations across 387 Industries)**

	1963	1967	1972	1977	1982
Market Shares					
1963 Firms	1.00	.861	.729	.657	.578
		(.104)	(.169)	(.202)	(.222)
1967 Entry Cohort		.139	.083	.067	.053
		(.104)	(.062)	(.054)	(.044)
1972 Entry Cohort			.189	.131	.099
			(.130)	(.088)	(.069)
1977 Entry Cohort				.147	.098
				(.109)	(.074)
1982 Entry Cohort					.173
					(.113)
Average Size of Surviving Firms Relative to All Firms in the Industry					
1963 Firms	1.00	1.49	2.13	2.92	3.76
		(.406)	(1.13)	(1.90)	(3.37)
1967 Entry Cohort		.352	.597	.915	1.32
		(.240)	(.485)	(.935)	(1.47)
1972 Entry Cohort			.396	.686	1.07
			(.250)	(.455)	(.867)
1977 Entry Cohort				.308	.560
				(.202)	(.357)
1982 Entry Cohort					.346
					(.204)
Cumulative Cohort Exit Rates					
1963 Firms		.419	.640	.741	.815
		(.116)	(.120)	(.118)	(.109)
1967 Entry Cohort			.639	.790	.876
			(.100)	(.075)	(.063)
1972 Entry Cohort				.575	.782
				(.103)	(.090)
1977 Entry Cohort					.632
					(.111)

[25] In Sections 3 and 4 we have derived the cross sectional patterns in each census year for the largest firms responsible for 99% of each industry's output in that year. While desirable for cross sectional comparisons, this type of cutoff creates difficulties when examining longitudinal patterns because small continuing firms can shift in and out of the 99% sample in different years. This would result in a comparison of slightly different groups of firms in different years. To avoid this difficulty the longitudinal comparisons in this section include all firms.

producers in an industry? If they do become major producers, how long does the process take? Finally, does the postentry performance of new and diversifying entrants differ?

Table 8 presents the market shares and average sizes of surviving firms and the cumulative failure rate for each entry cohort in each census year. The figures in the table are the means across 387 four-digit industries in each time period, with standard deviations in parentheses. The market share of each cohort declines, on average, in each census year following entry. On average across industries and time periods, the market share of firms that entered since the previous census is .162. The average shares of firms that entered in each of the two preceeding censuses are .104 and .083, respectively. Equivalently, each group of entrants is on average responsible for its largest share of industry output in the census year in which it is first observed.[26]

The decline in the market share of each cohort as the cohort ages is the result of two potentially conflicting forces: the change in the size of surviving members of the cohort and the exit of firms from the cohort.[27] To investigate the former, we summarize the size of the surviving cohort members (measured relative to the size of all firms present in the industry, so that cross cohort size comparisons can be made) in the middle of Table 8. On average across industries, the size of each cohort's surviving firms increases (relative to all firms in the industry) as the cohort ages. For example, the entering firms in 1967 produce output equal to 35.2% of the average firm output in their industry. In 1972 the surviving members of this 1967 cohort have an average output level equal to 54.3% of the average firm output in their industry. The size of these 1967 firms continues to increase until it is 127% of the industry average by 1982.

The bottom of Table 8 reports the average of the cumulative failure rates for each cohort over time. We find substantial rates of failure. The figures for the 1967, 1972, and 1977 entrants indicates that, on average across four-digit industries, 61.5% of all firms exit in the five years following the first census in which they are observed. On average, 79.6% of all firms exit within ten years.

The standard deviation across industries of cohort market shares and failure rates decreases over time for each cohort. In contrast, the standard deviation across industries of the relative size of surviving firms increases over time for each cohort, which indicates that the change in the average size of surviving firms varies greatly across industries. Equivalently, there is more diversity across industries in a cohort's average postentry firm size than in the cohort market shares, failure rates, or average entry size.

The patterns in Table 8 are robust to both census year and cohort-specific factors. They reveal that, on average, there is a decline in the market share of each entering cohort as it ages. This reflects a decline in the number of firms in the cohort that more than offsets the rise in the average size of the surviving members of the cohort relative to all firms in the industry. It remains an open question whether the increase in average size results because

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[26] The standard deviation across industries also declines over time for the 1967, 1972, and 1977 cohorts. This occurs because in the great majority of industries the market share of each cohort declines as the cohort ages. As a result, the market shares of any cohort become more similar across industries over time. Between 1967 and 1972 the market share of the 1967 entry cohort declined in 343 of the 387 industries. In the 1972–1977 and 1977–1982 periods 301 and 293 industries had a decline in the share of the 1967 cohort. The number of industries in which the 1972 cohort's market share declines is 341 and 320 over the last two time periods. The 1977 cohort's share declined in 355 industries between 1977 and 1982. The firms present in 1963, however, have the opposite pattern: the standard deviation of their market share across industries increases over time. This occurs because the 1963 firms are not a true entry cohort, but rather include all firms in operation in the industry in 1963. Their market share is by construction 1.0 in all industries in 1963, and thus the across industry dispersion of their market shares must increase over time as the industries experience different degrees of growth and entry.

[27] Dunne, Roberts, and Samuelson (forthcoming a) study the relationship between plant characteristics, failure rates, and growth rates of surviving plants in the U.S. manufacturing sector. They find significant differences based on plant age, size, and ownership status. Evans (1987a, 1987b) also examines the relationships among firm characteristics, failure, and growth.

surviving firms grow or because failure is concentrated among the smaller firms in the cohort.[28]

The figures in Table 8 aggregate over all types of entrants. Tables 9, 10, and 11 provide similar information disaggregated for the three types of entrants: new-firm, new-plant, diversifying-firm, new-plant, and diversifying-firm, product-mix. The pattern of market shares for each entry method in Table 9 is similar to the overall cohort pattern found in Table 8. Both the mean and standard deviation of each cohort's market share declines as the cohort ages. This pattern holds for each of the three entrant categories in each of the 1967, 1972, and 1977 entry cohorts. Diversifying firms that enter through the construction of new plants show the smallest decline in the cohort's market share with age, although they also have the smallest initial share. The market shares of the new-firm, new-plant entrants tend to be larger than the shares of the diversifying-firm, product-mix entrants, with each group losing slightly more than one-half of its initial cohort market share over a ten-year period.

Larger differences among entrant types emerge when we examine entrants' relative sizes. Table 10 reports the average size of surviving firms (relative to the average size of all firms in the industry) disaggregated by entry cohort and entry method. A pattern similar

TABLE 9 **Market Shares of Entry Cohorts and Entry Categories by Year (Means and Standard Deviations across 387 Industries)**

	1963	1967	1972	1977	1982
1963 Firms	1.00	.861	.729	.657	.578
		(.104)	(.169)	(.202)	(.222)
1967 Entry Cohort					
NF/NP		.062	.033	.025	.019
		(.059)	(.036)	(.027)	(.022)
DF/NP		.020	.019	.018	.015
		(.025)	(.025)	(.026)	(.026)
DF/PM		.058	.032	.026	.020
		(.066)	(.040)	(.038)	(.031)
1972 Entry Cohort					
NF/NP			.099	.065	.046
			(.088)	(.055)	(.042)
DF/NP			.040	.034	.030
			(.040)	(.040)	(.040)
DF/PM			.052	.032	.024
			(.051)	(.040)	(.032)
1977 Entry Cohort					
NF/NP				.073	.047
				(.066)	(.044)
DF/NP				.017	.015
				(.020)	(.021)
DF/PM				.059	.038
				(.056)	(.046)
1982 Entry Cohort					
NF/NP					.095
					(.069)
DF/NP					.021
					(.033)
DF/PM					.059
					(.052)

[28] Dunne, Roberts, and Samuelson (forthcoming b) find that both of these factors are important for the U.S. chemical industries.

TABLE 10 **Average Size of Surviving Firms Relative to All Firms in the Industry for Entry Cohorts and Entry Categories by Year (Means and Standard Deviations across 387 Industries)**

	1963	1967	1972	1977	1982
1963 Firms	1.0	1.49	2.13	2.92	3.76
		(.406)	(1.13)	(1.90)	(3.37)
1967 Entry Cohort					
NF/NP		.270	.392	.551	.750
		(.213)	(.355)	(.556)	(.842)
DF/NP		1.41	2.82	4.26	5.55
		(2.06)	(4.60)	(6.69)	(9.98)
DF/PM		.404	.725	1.14	1.53
		(.390)	(1.03)	(1.70)	(2.03)
1972 Entry Cohort					
NF/NP			.319	.518	.752
			(.243)	(.400)	(.639)
DF/NP			1.39	2.49	3.49
			(1.77)	(2.93)	(4.28)
DF/PM			.406	.681	1.036
			(.392)	(.692)	(1.07)
1977 Entry Cohort					
NF/NP				.229	.406
				(.166)	(.299)
DF/NP				1.07	2.22
				(1.40)	(3.17)
DF/PM				.456	.780
				(.416)	(.827)
1982 Entry Cohort					
NF/NP					.320
					(.211)
DF/NP					1.42
					(2.86)
DF/PM					.339
					(.277)

to that found in Table 8 is again observed: as a cohort ages, the average size of surviving members increases relative to the average size of all producers. The mean and standard deviation across industries increases as the cohort ages for each entry cohort and entrant type. Diversifying firms entering with new plants have the largest relative size of the three types. They begin production at an output level larger than the average size firm in the industry and have the largest standard deviation across industries. Diversifying-firm, product-mix entrants have a slightly larger relative size in the year they enter than do new-firm, new-plant entrants, with this difference increasing as the cohort ages. In particular, diversifying-firm, product-mix entrants begin producing at approximately 40% of the average output level of all firms in the industry, while the corresponding figure for new-firm, new-plant entrants is 28%. After a ten-year period, the surviving diversified-entry members of the entry cohort are producing an output level approximately equal to that of the average firm in the industry, while the average new firm that enters an industry tends to remain at less than average size.

Table 11 presents the cumulative exit rate for each cohort and category of entrants. For each cohort in each year, the exit rate is lowest for the diversifying-firm, new-plant entrants. For the 1967 and 1972 cohorts the initial exit rates of the diversifying-firm, product-mix entrants exceed the rates for the new-firm, new-plant entrants. The differences in the cumulative exit rates, however, narrow as the cohorts age.

TABLE 11 **Cumulative Exit Rates of Entry Cohorts and Entry Categories by Year (Means and Standard Deviation across 387 Industries)**

	1963–1967	1967–1972	1972–1977	1977–1982
1963 Firms	.419	.640	.741	.815
	(.116)	(.120)	(.118)	(.109)
1967 Entry Cohort				
NF/NP		.638	.785	.879
		(.137)	(.100)	(.081)
DF/NP		.496	.655	.746
		(.320)	(.298)	(.266)
DF/PM		.675	.823	.894
		(.134)	(.109)	(.097)
1972 Entry Cohort				
NF/NP			.565	.787
			(.128)	(.107)
DF/NP			.502	.676
			(.224)	(.224)
DF/PM			.622	.800
			(.151)	(.134)
1977 Entry Cohort				
NF/NP				.637
				(.134)
DF/NP				.540
				(.279)
DF/PM				.631
				(.145)

In summary, the market share of each entering cohort generally declines as the cohort ages. This occurs because high exit rates, particularly when the cohort is young, overwhelm any increase in the relative size of the surviving cohort members. The lowest mean exit rates, the largest mean relative size of entrants, and the most stable cohort market shares occur for diversifying firms that enter an industry through new-plant construction. Diversifying-firm, product-mix entrants and new-firm, new-plant entrants are more similar in terms of exit rates and relative sizes, although the mean relative size of product-mix entrants increases more substantially after entry. The across-industry dispersion of exit rates and relative sizes also tends to increase more substantially over time for the product-mix entrants.

6. Conclusions

■ Empirical work to quantify actual patterns of firm entry, growth, and exit has lagged behind the development of theoretical models of the entry and exit process. Largely because of data availability, most existing empirical studies have focused on the relationship between an industry's net entry rate and traditional measures of industry structure, such as minimum efficient plant size, concentration, industry growth, and advertising intensity. This article uses a newly constructed firm-level panel data set to provide a summary of the basic patterns of firm entry, growth, and exit in the U.S. manufacturing sector. Rather than examining the across-industry correlation between entry or exit rates and market structure variables, we focus on three aspects of the entry and exit process for which the data are particularly suited: the relative importance of different types of entrants, the correlation of entry and exit patterns across industries and over time, and the entrants' postentry size and exit patterns.

As reported in Sections 3–5, there is significant variation in the entry patterns and in the subsequent size and exit patterns for different categories of entrants. For example, diversifying firms that enter an industry with a new plant are generally initially larger and are

less likely to fail than are other types of entrants. New-firm entrants and diversifying firms that enter through changes in the mix of products they manufacture in their existing plants are of roughly equal initial importance in terms of market shares. While this latter group of diversifying entrants tends to have higher failure rates than new-firm entrants, on average the firms that survive tend to be much larger in subsequent years than the new-firm entrants that survive.

The heterogeneity in entry and exit patterns across industries is substantial. In addition, we find a high degree of correlation between entry and exit rates across industries. These differences in industry entry and exit patterns persist over time. As a result, net entry rates exhibit less across-industry variation than either gross entry or exit rates, and industries may be more consistently characterized by turnover rates than by net entry rates.

Finally, we find that the market share of each entering cohort of firms declines as the cohort ages. This decline is driven by high exit rates that overwhelm the increase in the average size of surviving cohort members. Diversifying firms that enter through new-plant construction exhibit the most stable cohort market shares, while diversifying product-mix entrants register the most dramatic increase in the average size of survivors. The effect of entrants in an industry may depend upon their postentry performance, and these results suggest that this effect may vary significantly with the type of entrant.

Our findings suggest two areas in which further research with these data could proceed. The high correlation between entry and exit across industries indicates that industries differ substantially in their degree of firm turnover. One area for further study is then to identify the characteristics of industry technology and demand that give rise to across industry differences in turnover. Second, the finding of substantial heterogeneity in both the initial and postentry characteristics of different categories of entrants raises questions about both possible differential effects on within-industry competition and differential contributions to the long-run evolution of industry structure.

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