The Role of Firms in Job Creation and Destruction in U.S. Manufacturing

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At least since the deep recession of 1981–82, changes in corporate organizational structure have been viewed as a primary cause of employment adjustment. The popular notion of corporate downsizing is a leading—albeit somewhat misleading—example, but other types of reorganization abound. Mergers and acquisitions, machine replacement and retooling, innovative production management strategies, outsourcing, business births and deaths, and related decisions about corporate structure typically are associated with the creation and destruction of jobs.

Motivated in part by these developments, research in recent years has documented extensively the fact that labor markets are characterized by large and pervasive flows of jobs among places of employment.[1] Researchers have developed large data bases such as the U.S. Census Bureau's Longitudinal Research Database (LRD), which contains detailed information on job flows among employers in manufacturing. In the U.S. manufacturing sector, for example, one in 10 jobs was destroyed and one in 11 was created in an average year between 1972 and 1993 (Schuh and Triest 1998).[2]

However, virtually none of this research and evidence pertains to the role of the firm and its decisions in determining job creation and destruction. Previous research and data-gathering efforts have focused on employment at individual physical locations called establishments, or plants. Information about the corporate ownership of the establishments either has not been available or has not been examined much yet.

This neglect is unfortunate, because it leaves fundamental questions regarding the role of firms in labor markets unanswered. In particular, to what degree do job creation and destruction result from firms shuffling jobs between plants that they own? Job reallocation occurring within firms may have very different causes and consequences from that occurring between firms. A firm that is simultaneously decreasing employment at some plants while increasing employment at others is

likely engaged in an effort to reduce its cost of production or to shift the composition of its output across product lines so as to increase profits. In some cases, workers can be transferred between plants and the shift can occur without workers losing their jobs and suffering an episode of unemployment. In contrast, when the job shifts occur between (rather than within) firms, workers at firms that are destroying jobs will necessarily lose their jobs. And the causes of the shifting of jobs between firms may be quite different from the causes of the within-firm job shifts. A firm with a decreasing level of employment may suffer from lack of access to credit, or it may have been hit with an idiosyncratic shock to its product demand (such as the entry of a new competitor in its product market) or cost structure.

Job reallocation occurring within firms may have very different causes and consequences from that occurring between firms.

This article provides initial results from our ongoing study of the role of firms and corporate reorganization in the determination of job creation and destruction (see also Schuh and Triest 1999a). We use information about corporate structure found in the LRD to construct measures of job creation and destruction over five-year intervals for U.S. manufacturing firms, and their plants, during the period 1967 to 1992. Although we would like to study this issue for nonmanufacturing firms and establishments as well, the LRD is the only suitable U.S. data base available at present.

Our results are striking. A sizable portion of the reallocation of jobs between plants owned by multiplant firms occurs within these firms. For example, less than half of the reallocation of jobs between plants owned by firms with at least 11 plants is between firms. A majority of the plant-level job flows for these large firms appear to be due to the shuffling of jobs between plants owned by the same firm. In contrast, nearly all plant-level job flows occurring at firms with only one or two plants are between, rather than within, firms. This result is not surprising; there is little scope for reallocation of jobs within firms owning only one or two plants. Aggregating over the different types of firms leads to the conclusion that about three-fourths of the reallocation of jobs between manufacturing plants occurs between firms.

The rates of job creation and job destruction differ according to the number of plants a firms owns. Both rates tend to decrease as the number of plants a firm owns increases. This is true to a somewhat greater extent for job creation than for job destruction. As a result, the net employment growth rate also tends to decrease as the number of plants a firm operates increases. Aggregate employment in single-plant manufacturing firms has increased over time, but aggregate employment in multiplant manufacturing firms has decreased.

The article also documents that the employment size of plants tends to rise sharply with the number of plants a firm operates. Previous work (Schuh and Triest 1998) showed that large plants tend to dominate movements in job flows over the business cycle, although their job flows tend to be less permanent than those of small plants. Combining this result with our new finding, that a large part of the job flows at plants owned by large firms occurs within firms, suggests that large firms may use recessions as an opportunity to engage in corporate restructuring.

The article begins with a discussion of how firm-level decisions generate job creation and destruction, and why this process matters for labor markets and workers. The article then formally defines the concepts of plants, firms, job creation and destruction, and related measures used in subsequent sections. Next, it reports descriptive statistics on the nature of U.S. manufacturing firms and plants, and then it presents our main results on the links between firms and job creation, destruction, and related concepts. The concluding section summarizes our results and briefly outlines some of the issues we are investigating in our ongoing research in this area.

I. Firm Decisionmaking and Job Flows

A firm's demand for workers is derived from the demand for its output, so anything that shifts its output demand schedule is likely to shift its labor

[1] For examples in U.S. manufacturing, see Dunne, Roberts, and Samuelson (1989); Davis, Haltiwanger, and Schuh (1996); and Schuh and Triest (1998).

[2] These statistics refer to job creation and job destruction measured at the manufacturing establishment level at an annual frequency. Precise definitions of these concepts are provided in Section II of this article.

demand schedule as well. Of course, the firm's labor demand schedule may also be shifted by changes in its cost structure. For a single-plant firm, this is straightforward. With only one plant, the firm's managers decide how much to produce and how much labor to employ, but they do not need to make decisions regarding how to split production and employment among plants. If the firm finds it profitable to expand employment, job creation results. And if profit maximization dictates a decrease in employment, there is job destruction.

Multiplant Firms

Things are considerably more complex when a firm owns more than one plant. It is useful to consider two polar cases. At one extreme is the situation where each plant produces a distinct product and essentially is run as an independent business. In this case, the managers of each plant make employment decisions in much the same way as they would if they were the managers of a single-plant firm. One difference, however, is that some interdependence may exist among the plants owned by the firm, because of factors such as common management philosophies, corporate administrative services and expenses, and firm-level effects in access to credit markets and the cost of capital.

At the other extreme, a firm operates multiple plants producing the same product. In this case, production will be allocated across plants in order to minimize the total costs of production and distribution. A change in the relative costs of production across plants, perhaps due to changes in local labor market conditions, will result in some of the firm's plants creating jobs and others destroying jobs.

Most multiplant firms likely lie somewhere between these two polar cases. As changes occur in product demand, factor costs, and available technology, firms will find it desirable to change both their overall mix of products produced and the mix of products at each plant. In the short run, some of the firm's plants may add workers while others reduce employment. In the longer run, some of the firm's plants may be retooled to produce new products or adopt new production technologies, resulting in further changes in employment levels.

Startups, Shutdowns, and Retooling

Firms and plants experience life cycles. They start up, going from zero to positive employment, when profitable new business opportunities arise or when they resume temporarily suspended operations. Equipment gradually depreciates, wearing out or becoming obsolete, and new investment is needed. Plants and firms eventually shut down, going from positive to zero employment, when expected future profits wane and the permanent closure or temporary suspension of operations becomes necessary. Startups and shutdowns always entail extraordinary job creation and destruction.

Decreasing demand for products or increased costs, perhaps exacerbated by lack of access to sufficient credit, may result in a firm ceasing operations and discharging all of its employees. Plants owned by multiplant firms may shut down under less extreme conditions. A firm may choose to replace a plant's capital equipment as it depreciates, or it may choose instead to invest in a new plant (or expand another existing plant) located in a lower-cost region or to invest in a plant with a totally new and lower-cost design. If the firm chooses not to replace a plant's equipment as it depreciates, the plant will eventually become unprofitable to operate and be shut down.

Reallocation between firms is likely to be due primarily to changes in product demand or costs across firms. In contrast, reallocation of jobs between plants owned by a given firm may be due to changes in the relative costs of operating the plants or changes in the mix of products.

Partial, or temporary, cutbacks in production and employment for retooling can be regarded as less extreme forms of shutdowns. As an existing plant becomes economically obsolete, the firm chooses to temporarily cut back or suspend operations in order to update the plant rather than invest in a new plant. In this case, the plant's location is still optimal (relative to the cost of building and staffing a new plant at a different site), but the equipment or product lines need to be updated.

Differences Between Reallocation Within Firms and Reallocation Between Firms

The causes and consequences of the reallocation of jobs between plants owned by a given firm may be quite different from those of the reallocation of jobs between firms. Reallocation between firms is likely to be due primarily to changes in product demand or costs across firms, which change firms' desired (profit-maximizing) level of employment. In contrast, reallocation of jobs between plants owned by a given firm may be due to changes in the relative costs of operating the plants or changes in the mix of products a firm wishes to produce. Changes in the relative costs of operating different plants owned by a single firm evolve relatively slowly over time, resulting in within-firm job reallocation being planned over a longer time horizon. Between-firm job reallocation is more likely to reflect relatively fast-moving changes in product demand or firm-specific credit availability.

Although job flows between firms necessarily involve workers changing employers, this may not be the case for job flows within firms. In an extreme case, a firm may build a new plant a few blocks away from an existing plant, and transfer all of the workers to the new plant upon its completion. This would result in massive measured job flows between the two plants but no change in employers for any of the workers. In other cases, however, within-firm job flows do result in worker dislocation. A firm might shift jobs between plants located far enough apart to make employee transfers impractical, or the skill requirements of the jobs being created may be very different from those of the jobs being destroyed.

II. Theory and Measurement of Job Flows Between Plants and Firms

This section formally defines the concepts of plants, firms, job creation, job destruction, and related measures of net and gross job flows used in this article. (See Davis, Haltiwanger, and Schuh (1996); Haltiwanger and Schuh (1999); and Schuh and Triest (1999a) for more details.) Readers familiar with this earlier research may skip on to the next section.

Economists have devoted much effort to developing deep, formal definitions of the firm and to understanding how and why firms emerge and exist. However, for the purposes of this study, the basic practical definitions developed by government data-gathering agencies will suffice.

The basic building block of a manufacturing firm is the *plant*. A plant is a single, physical location where production of manufactured goods takes place—that is, a factory, mill, warehouse, and the like. Plants are identified by the longitude and latitude of the land on which they are built.

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Firms are distinguished by common corporate ownership of plants. Specifically, U.S. Bureau of the Census (1979) states: "The enterprise [firm] is the entire economic unit consisting of one or more establishments [plants] under common ownership or control. It may vary in composition from a single legal entity (e.g., corporation, partnership, individual proprietorship) with only one establishment to the most aggregate level of business organization, as a complex family of legal entities (and their constituent establishments) under common ownership or control" (p. 12).

Total Job Flows Between Plants

Let E_{ift} represent the level of employment, where the subscripts denote the plant (i), firm (f), and time period (t) of employment, and let Δ denote the first-difference operator, $\Delta E_t = E_t - E_{t-1}$. Then job creation and destruction are defined as positive and negative plant-level employment changes, respectively:

$$C_{ift} = \begin{cases} \Delta E_{ift} & \text{if } \Delta E_{ift} > 0, \\ 0 & \text{otherwise, and} \end{cases}$$

$$D_{ift} = \begin{cases} |\Delta E_{ift}| & \text{if } \Delta E_{ift} < 0, \\ 0 & \text{otherwise.} \end{cases}$$

Gross job creation and destruction are the sums of positive and negative plant-level employment changes, respectively, across all plants. These summations can be taken across all plants in a firm, which

yields firm-level gross job creation (C_{ft}) and destruction (D_{ft}), or across all plants, which yields aggregate gross job creation (C_t) and destruction (D_t). Net employment change at the plant, firm, or aggregate level is simply the difference between creation and destruction: $N = C - D$. Net and gross job flows are expressed in rates (percent of employment).[3]

A common measure of the total impact of gross job creation and destruction on labor markets is the concept of job reallocation. Gross job reallocation is the sum of all jobs created and destroyed: $R = C + D$. Note that even when aggregate net employment is unchanged ($N = 0$), job reallocation may be very high. However, this measure can provide a misleading indication of job churning when all, or most, of the action is either in creation or destruction. A better measure in the long run is excess job reallocation, $X = R - |N|$, which is the amount over and above that needed to accommodate net employment changes.

Job Flows Between and Within Firms

Job flows between firms are analogous to job flows between plants, except they are based on firm-level, rather than plant-level, employment changes.[4] Firm-level employment is the weighted sum of employment in all plants of the firm,

$$E_{ft} = \sum_{i \in f} \omega_{it} E_{ift},$$

where ω_{it} is the plant's sample weight.[5] Thus, job flows "between" firms (denoted by superscript b) are defined as *firm*-level positive and negative employment changes, respectively:

$$C^b_{ft} = \begin{cases} \Delta E_{ft} & \text{if } \Delta E_{ft} > 0, \\ 0 & \text{otherwise, and} \end{cases}$$

$$D^b_{ft} = \begin{cases} |\Delta E_{ft}| & \text{if } \Delta E_{ft} < 0, \\ 0 & \text{otherwise.} \end{cases}$$

Between-firm measures of net employment (N^b), gross job reallocation (R^b), and excess reallocation (X^b) are defined analogously. Note that firms, like plants, also can start up or shut down if all plants within the firm start up or shut down.

Although mechanically similar to gross job flows between plants, job flows between firms are not "gross" flows in the same sense as the plant flows. In particular, gross job flows among plants within a firm equal job flows between that firm and other firms (that is, $C_{ft} = C^b_{ft}$ and $D_{ft} = D^b_{ft}$) only when employment changes at all plants in the firm are either all positive or all negative. This case is of course always true for single-plant firms. More generally, however, job flows between firms account for only a fraction of the total job flows between plants. Thus, job flows between firms abstract from employment changes at plants within the firm.

We are interested in measuring the shares of gross job flows between firms within the total gross job flows between plants. For example, the between-firm share of aggregate job creation is $\alpha^c_t = c^b_t / c_t$; shares for other gross flows are defined analogously.[6] These shares indicate the extent to which the rates of total gross job flows between plants are attributable to decisions made by firms about the overall employment size of the firm—a decision that is not made by individual plants in firms with multiple plants. The remainder, $1 - \alpha^c_t$, provides an upper bound on the fraction of job creation occurring within firms.

Unfortunately, it is not possible to construct exact measures of job flows within firms, for technical reasons described in Haltiwanger and Schuh (1999).[7] Thus, for example, residual job creation, $\tilde{C}_t = C_t - C^b_t$, is *not* an exact measure of within-firm job creation.

Before turning to how the job flows are actually constructed from the data, it may be useful to review examples of the calculations described above. Table 1

[3] Employment size at the plant level is defined as the average of current and lagged employment,

$$Z_{ift} = 0.5(E_{ift} - E_{if,t-1}),$$

with firm-level and aggregate employment size defined analogously. Growth rates defined relative to Z are symmetric and bounded by [−2,2], making it feasible to construct finite rates for plants that start up (employment changes from zero to positive, growth rate of 2) and shut down (employment changes from positive to zero, growth rate of –2).

[4] The issues in this subsection are analogous to the study of gross job flows between detailed industries found in Haltiwanger and Schuh (1999).

[5] In this article, the sample weight always equals one (1.0) because the data are from censuses of the manufacturing universe and thus include all plants in all firms. In the future, we plan to construct annual rates of firm-level gross job flows, in which case annual sampling weights will be used to construct firm aggregates. Note, however, that difficult sampling issues arise in this case. See U.S. Bureau of the Census (1979) for details.

[6] Note that for net employment growth, $\alpha^n_t = (n^b_t / n_t) = 1$, always provided that all plants in all firms are included in the measure.

[7] The reason is related to the definition of job destruction as a positive number and the use of the max(.) mathematical operator. Thus, job reallocation is an absolute deviation of employment growth rates rather than a standard variance measure, which can be decomposed exactly into "between" and "within" components.

Table 1
Illustration of Gross Job Flow Calculations

	Employment in:		Net	Between Plants		Between Firms		Ratio: Between Firms to Between Plants	
	Period 1	Period 2	Change	Job Creation	Job Destruction	Job Creation	Job Destruction	Creation	Destruction
Firm A	20	50	30	30	0	30	0	1.00	
Plant 1	20	50	30	30	0				
Firm B	230	300	70	80	10	70	0	.88	0
Plant 1	80	70	−10	0	10				
Plant 2	150	230	80	80	0				
Firm C	7600	7480	−120	90	210	0	120	0	.57
Plant 1	650	590	−60	0	60				
Plant 2	250	290	40	40	0				
Plant 3	5000	4850	−150	0	150				
Plant 4	1700	1750	50	50	0				
Total Economy	7850	7830	−20	200	220	100	120	.50	.55

Note: Net employment change is the same between plants and between firms.
A blank cell indicates concepts that are not meaningful or cannot be calculated.

provides an illustrative example of how the job flows and related measures would be calculated in a hypothetical economy with three firms, two of which operate multiple plants.

Data Measurement

We use the Longitudinal Research Database (LRD) from the U.S. Census Bureau to construct gross job flows. This effort extends the work of Dunne, Roberts, and Samuelson (1989), who used the LRD to construct quinquennial (five-year) gross job flows, and Davis, Haltiwanger, and Schuh (1996), who used the LRD to construct annual and quarterly gross job flows. Both prior studies focused on job flows between plants rather than firms.

The LRD contains historical economic data for 1963 to 1995 from the Census of Manufactures (CM) and Annual Survey of Manufactures (ASM).[8] The CM is conducted in years ending in "2" or "7" (except for 1963) and covers the universe of all plants and firms. The ASM is conducted annually in the years between censuses. It covers only a probability sample of plants in most years, which makes it impossible to construct comprehensive annual firm-level data.[9] The basic sampling unit of the LRD is a plant, but information is included that accurately identifies both plants and their parent firms in each year. This feature, combined with the vast wealth of economic information about plants and firms, makes the LRD the most suitable U.S. data base available.[10]

We construct firm-level gross job flows on a quinquennial basis for the universe of plants and firms, leaving the construction of annual data for future research. Our results both extend those in Dunne, Roberts, and Samuelson (1989) with more recent data, and provide new insights and findings. Our methodology follows that of Davis, Haltiwanger, and Schuh (1996) for annual and quarterly job flows,

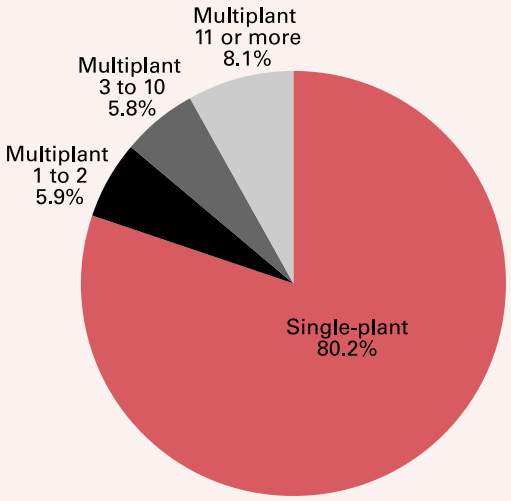
[8] The LRD contains data only on the manufacturing activity of manufacturing firms. Some firms also have nonmanufacturing activity, which is excluded from the LRD data.

[9] Prior to 1979, if a plant was selected for the ASM, then all other plants in the firm that owned the ASM plant were also included in the ASM automatically. This methodology was costly and statistically unnecessary, thus dropped in 1979, at which point plants were selected independently of firm ownership. Comprehensive firm-level data are available from the LRD at quarterly and annual frequencies for 1972 to 1978.

[10] The obvious drawback of the LRD is that it covers only manufacturing. A promising data source that includes U.S. nonmanufacturing data is the Census Bureau's new Longitudinal Establishment and Enterprise Microdata (LEEM) file, described in Acs and Armington (1998). Unfortunately, the LEEM file includes data only for 1988 to 1995 at present, and it does not include the wide array of economic and demographic information about plants and firms that is in the LRD.

Figure 1

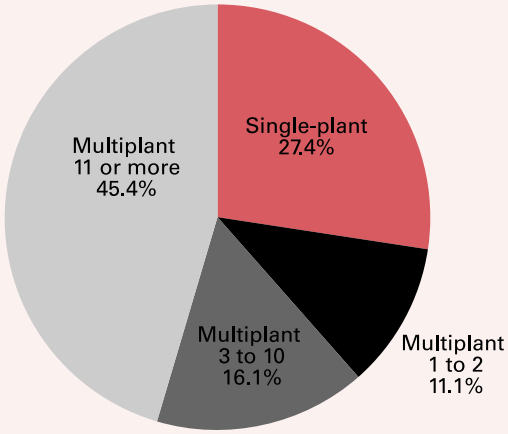
Average Number of Manufacturing Plants per Firm, 1967 to 1992



Source: Authors' tabulations from the Longitudinal Research Database (LRD).

Figure 2

Average Distribution of Manufacturing Employment, by Number of Plants per Firm, 1967 to 1992



Source: Authors' tabulations from the Longitudinal Research Database (LRD).

with one notable exception: We have not imposed any of the intricate restrictions developed to screen out invalid employment changes.[11]

III. Evidence on Types of Firms

This section reports three kinds of descriptive characteristics of manufacturing firms in the LRD: 1) the distribution of plants across firms, 2) the distribution of employment across firms and across plants within firms, and 3) the geographic and industrial diversity of firms that own multiple plants. A central characteristic is firm type, defined as the number of plants in a firm. We distinguish between firms with one plant (single-plant) and firms with more than one plant (multiplant), then classify multiplant firms into subgroups: 1 to 2 plants, 3 to 10 plants, and more than 10 plants (11+).[12]

Firm Characteristics and Employment

The data reveal a dichotomy between what we will simplistically call "large" and "small" firms, in terms of number of plants owned and number of employees. Most plants are in single-plant firms, but most employment is in multiplant firms—especially in firms with the most plants. Firms with few plants tend to own small plants that employ few workers, whereas firms with many plants tend to own plants that employ many workers. Average employment size has been declining for all types of firms, especially larger firms.

Most plants are in single-plant firms. Figure 1 shows that four-fifths of all plants belong to single-plant manufacturing firms. The remaining one-fifth of plants are roughly equally divided among the three multiplant firm groups, although the 11+ firms have a slightly larger share. These shares have not changed much over time.

Most employment is in multiplant firms. Figure 2 shows that almost three-fourths of all employment is in multiplant firms, whereas single-plant firms have

[11] Mainly, the reason is that these restrictions do not translate easily to quinquennial data. However, many spurious employment changes that occur at higher frequencies are related to difficulties with the sampling methodology, and these difficulties are much less severe in the quinquennial data.

[12] Because a firm may engage in manufacturing and nonmanufacturing activity, and we have data only on the former, some multiplant firms have only one manufacturing plant.

Table 2
Employment Size per Firm and Plant, 1967 to 1992

	Average Number of Employees per Firm				Average Number of Employees per Plant			
			1967 to 1992				1967 to 1992	
	1967	1992	Percent Change	Average Number	1967	1992	Percent Change	Average Number
All Firms	69.7	53.4	−23.5	62.4	61.3	46.3	−24.6	53.7
Single-Plant Firms	20.8	17.3	−16.7	18.3	20.8	17.3	−16.7	18.3
Multiplant Firms	855.6	547.5	−36.0	657.6	257.3	168.6	−34.5	198.5
1 to 2 Plants	186.1	134.1	−27.9	137.8	138.0	97.0	−29.7	101.2
3 to 10 Plants	929.2	512.5	−44.8	651.2	206.4	130.7	−36.7	151.8
11 + Plants	11,350.4	6,187.4	−45.5	8,678.2	383.5	251.2	−34.5	302.9

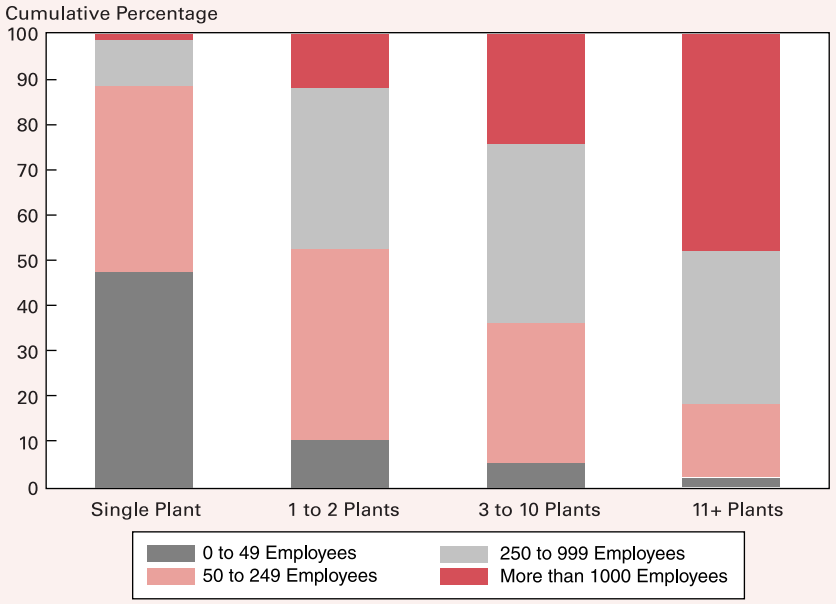
Source: Authors' tabulations from the Longitudinal Research Database (LRD).

less than 30 percent of employment. Employment in multiplant firms is skewed toward firms with more plants: Almost one-half is in the 11+ firms, while only about one-tenth is in firms with one or two plants. Employment shares have not changed much over time, except that the employment share of single-plant firms has risen very modestly.

Average firm employment size rises with the number of plants per firm. Table 2 shows that between 1967 and 1992, the average manufacturing firm had 62 employees. However, single-plant firms averaged fewer than 20 employees, whereas multiplant firms had more than 600. Firm employment size rises sharply as plant ownership increases, with 11+ firms employing nearly 9,000 workers.

Average plant employment size rises with the number of plants per firm. Table 2 also shows that single-plant firms employed fewer than 20 workers in an average plant, whereas multiplant firms employed nearly 200 per plant. Plant employment size also increases as the number of plants owned increases, though not as sharply, with 11+ firms employing about 300 workers per plant. Figure 3 further illus-

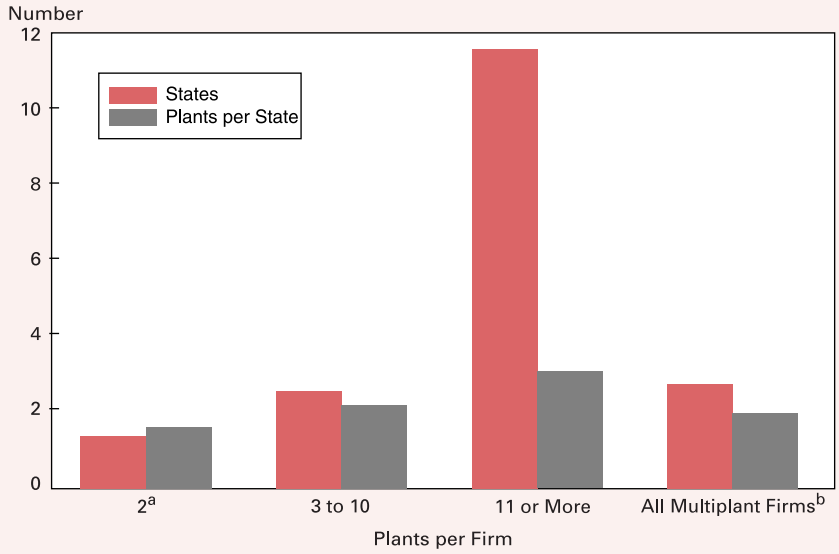
Figure 3
Average Distribution of Manufacturing Employment, by Number of Workers per Plant and Number of Plants per Firm, 1967 to 1992



Source: Authors' tabulations from the Longitudinal Research Database (LRD).

Figure 4

Geographic Diversity of Multiplant Firms: Average, 1967 to 1992



[a]This category does not include multiplant firms with only one plant because they cannot diversify geographically or diversify products by plant.
[b]All multi-unit plants with two or more plants.
Source: Authors' tabulations from the Longitudinal Research Database (LRD).

trates the point that multiplant firms own big plants, and single-plant firms small ones. Single-plant firms own mostly relatively small plants (less than 250 employees), but nearly half of all plants in 11+ firms employ 1,000 or more workers.[13]

Schuh and Triest (1998) documented pronounced differences in the patterns of job creation and destruction by plant employment size over the business cycle. They found that small plants are prone to destroy jobs through shutdowns and highly concentrated contractions. In contrast, large plants tend to destroy jobs in more moderate contractions, exhibit greater cyclical asymmetry between job creation and destruction, and have job flows that are somewhat less persistent. Evidence presented in the next section suggests that differences in job flows by plant size are linked to firm structure.

Average firm and plant employment sizes decline over time. Table 2 also reveals that the average employment size for all types of firms declined dramatically between 1967 and 1992. Employment in the average firm and plant fell throughout this period, ultimately declining by nearly one-fourth. Employment shrank by more than one-third in multiplant firms and nearly halved in firms with the most plants. Even employment in single-unit firms fell 17 percent.[14]

Geographic diversity increases with the number of plants per firm. Figure 4 shows that the average number of states in which a multiplant firm operates plants increases with the number of plants in the firm.[15] This result may seem intuitively obvious, but it is not *necessarily* true. A firm with more plants can operate in more states, but it could also locate them all in one state. The data on average number of plants per state show that firms with more plants also tend to operate more plants per state.

Within multiplant firms, the number of plants owned may be an important determinant of the extent to which gross flows among plants within firms involve shifts of jobs between local labor markets. Because firms with more plants tend to operate in a greater number of states, there is greater scope for gross job flows within these firms to involve shifts of jobs across local labor markets.[16] However, larger firms also tend to operate more plants per state, resulting in greater scope for job shifts within these firms within local labor markets. Further analysis of

[13] This result does not imply, however, that firms with many plants *only* own plants with many employees. In fact, firms with many plants also must own some plants with few employees, because the variance of plant size within firms is greater for firms that own more plants, as we reported in Schuh and Triest (1999a).

[14] Note, however, that declines in average firm and plant employment size do not necessarily mean that total employment declined. The size movements could merely reflect compositional changes from larger to smaller firms and plants within each category.

[15] These data, and those in Figure 6 below, are not weighted by any measure of firm size.

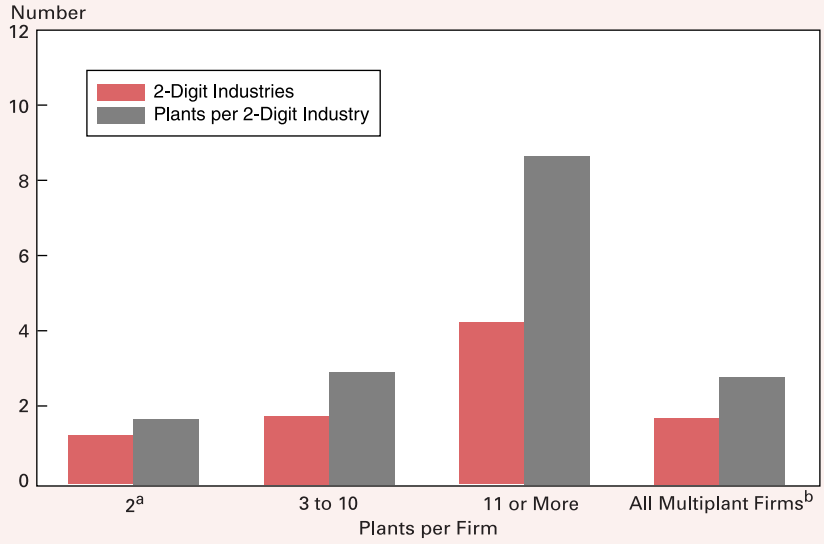
[16] We explore this issue in more detail in Schuh and Triest (1999b).

the data is needed to determine whether the proportion of within-firm job shifts that occur within local labor markets increases or decreases with the number of plants a firm operates.

Product diversity also increases with the number of plants per firm. Figure 5 shows that the average number of SIC 2-digit industries in which a firm operates plants increases with the number of plants in the firm, so firms with more plants operate in more industries (that is, produce more products). However, product diversity in firms with many plants is noticeably less extensive than geographic diversity: 11+ firms operate on average in nearly 12 states but only 4 industries. More detailed levels of industrial classification would show greater product diversity, of course. The number of plants per industry increases significantly with the number of plants per firm— much more so than plants per state. This result indicates that large firms tend to be relatively more concentrated industrially than geographically.

Figure 5

Product Diversity of Multiplant Firms: Average, 1967 to 1992



[a]This category does not include multiplant firms with only one plant because they cannot diversify geographically or diversify products by plant.
[b]All multi-unit plants with two or more plants.
Source: Authors' tabulations from the Longitudinal Research Database (LRD).

IV. Evidence on Job Flows and Net Employment Growth

Table 3 reports the time series averages of quinquennial job flows and net employment growth between plants and firms in U.S. manufacturing from 1967 to 1992.[17] This table and Figures 6 to 8 establish four important facts:

1. Firms create or destroy more than half of all their jobs every five years, but net employment changes very little by comparison.
2. Small firms create and destroy jobs at much higher rates than large firms, but net employment is growing at small firms and shrinking at large ones.
3. Differences in job flows between firms are primarily attributable to differences in the employment size of their plants; plant startups and shutdowns are much more important for small firms and plants.
4. Job flows between multiplant firms constitute less than 60 percent of the total job flows between plants owned by these firms, while the fraction of total job flows that are between firms is roughly three-fourths for the total manufacturing sector, including single-plant firms.

The remainder of this section elaborates on these facts.

Total Manufacturing Flows

Gross job flows between plants are huge. On average, among the plants of all firms, more than one in four jobs is created and more than one in four jobs is destroyed every five years.[18] Thus, more than half of

[17] The estimates of total job flows between plants update those first reported in Dunne, Roberts, and Samuelson (1989), which ran through 1982.

[18] The annual rates implied by these quinquennial rates are much smaller than those we reported previously (Schuh and Triest 1998) because a substantial fraction of annual employment changes

Table 3
Averages of Quinquennial Gross Job Flows in U.S. Manufacturing, 1967 to 1992

	Total between Plants (Percent of Employment)					Share between Firms			
	n	c	d	r	x	α^c	α^d	α^r	α^x
All Manufacturing	.9	28.3	27.4	55.6	51.1	.74	.73	.74	.72
Single-Plant Firms	7.9	43.4	35.5	78.9	70.9	1.00	1.00	1.00	1.00
Multiplant Firms	−1.6	22.8	24.4	47.3	40.2	.56	.59	.58	.52
1 to 2 Plants	−.3	31.1	31.4	62.5	54.9	.87	.87	.87	.85
3 to 10 Plants	1.7	26.9	25.2	52.2	46.3	.67	.63	.66	.61
11 + Plants	−2.5	19.5	22.0	41.5	34.3	.37	.42	.43	.29

Notes: Job flows are expressed as a percent of employment size, z. Variable n is net employment growth; c is job creation; d is job destruction; r is reallocation; and x is excess reallocation. The reason $x < r - |n|$ is because the table reports time-series averages and n changes sign over time.
Source: Authors' tabulations from the Longitudinal Research Database (LRD).

all manufacturing jobs are reallocated across plants every five years, and the vast majority of that gross job reallocation occurs in excess of net employment growth, as indicated by excess reallocation. These enormous job flows may be very costly for the workers involved.

Gross job flows are particularly large when compared with the 1 percent average rate of net employment growth in the five-year periods between 1967 and 1992. This positive growth is attributable primarily to a 13 percent increase in employment between 1963 and 1967. In any case, the primary conclusion is this: While the level of total employment changes very little over half-decade periods, on average, tremendous turnover occurs among individual jobs at plants.

Flows by Firm and Plant Type

Net and gross job flows are much higher at single-plant firms than at multiplant firms. Table 3 shows that single-plant firms created jobs at nearly twice the rate of multiplant firms, but they also destroyed jobs at a much higher rate. About three of four jobs at single-plant firms are reallocated every five years, whereas less than half of jobs at multiplant firms are. Job creation exceeded job destruction at single-plant firms, resulting in average net employment growth of 7.9 percent every five years. Job destruction exceeded job creation at multiplant firms, where net employment shrank at a rate of 1.6 percent every five years.

Table 3 also shows that gross job flow rates drop sharply as the number of plants owned by multiplant firms increases. Job flows at plants owned by firms with 1 to 2 plants are about 50 percent greater than those at firms with 11 or more plants. Differences in the job flow rates between small and large multiplant firms are at least as large as those between single-plant firms and small multiplant firms. This suggests that it may be more appropriate to analyze firms along a continuum of the number of plants owned, rather than focusing only on the dichotomy between single-plant and multiplant firms.

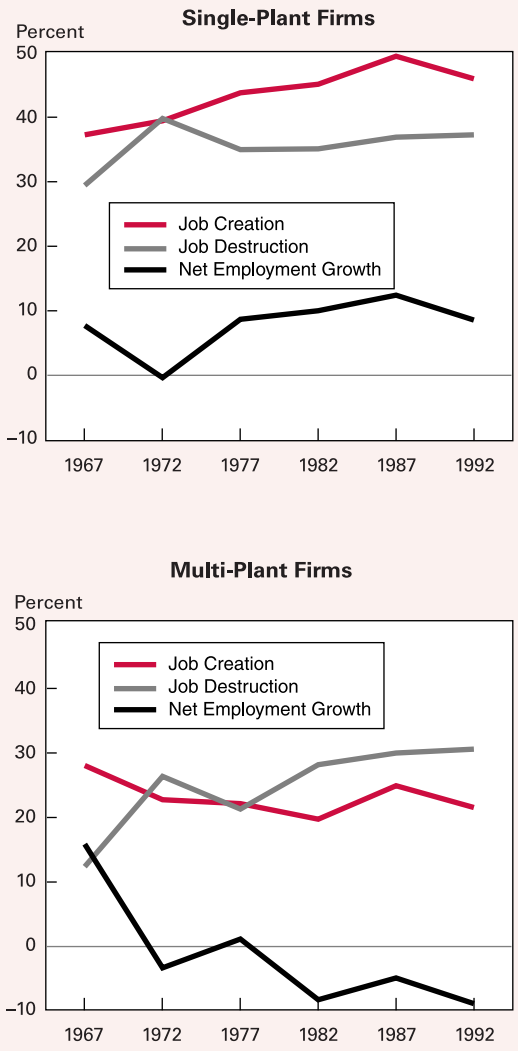
Job flows at multiplant and single-plant firms exhibit different trends. Figure 6 shows two dominant trends in job flows: Job creation in single-plant firms and job destruction in multiplant firms both increased substantially over time. Job creation in multiplant firms declined, so net employment growth in multiplant firms has tended to decline from its unusually high level in 1967. Job destruction for single-plant firms also increased, but only modestly, so net employment growth in single-plant firms tended to increase over the period.

The upward trend in job destruction at multiplant firms accords with the popular view that large manufacturers have slashed employment in recent decades. But this popular view misses the facts that these firms also created many jobs, and that increased job destruction at multiplant firms has been offset by increased job creation at single-plant firms. Thus, U.S.

are transitory and reversed within five-year intervals. The relationship is similar to that between annual and quarterly data described in Davis, Haltiwanger, and Schuh (1996).

Figure 6

Net and Gross Job Flows between Manufacturing Plants: Quinquennial, 1967 to 1992



Source: Authors' tabulations from the Longitudinal Research Database (LRD).

manufacturing has not been decimated by corporate reorganization (or any other factor). [19] However, it has been restructured through massive job reallocation, and total employment has declined slowly since the early 1970s.

Job Flows and Employment Size

Differences in job flows across firms are closely linked to differences in average plant size. Because firms with many plants tend to operate much larger plants (as was shown in Figure 3), the negative correlation between the number of plants operated and firm job flow rates may be attributable to the tendency of larger plants to have lower job flow rates than small plants do.

Figure 7, which shows job creation and destruction by plant size and the number of plants operated by the firm, confirms this hypothesis. Smaller plants have high job flow rates, regardless of whether they are owned by small single-plant firms or large multiplant firms. Note also that net employment is positive (creation bar taller than destruction bar) for most smaller plants, also regardless of firm type. Thus, plant size tends to be a more important determinant of average net and gross job flows than is firm type.

The result that large multiplant firms tend to have lower job flow rates because they own larger plants begs the question: Why does average plant employment size increase with the number of plants? Without an adequate answer to that question, we cannot be sure whether the higher average plant size of large firms is "causing" the relatively low job flow rates, or whether the high average plant size and low job flow rates are both caused by another unidentified factor.

Plant startups and shutdowns are much more important for small firms and plants. The proportion of job creation and destruction attributable to plant startups and shutdowns decreases modestly as the number of plants owned increases, and it decreases dramatically as plant size increases. Startups and shutdowns account for about half or more of all job creation and destruction in plants with less than 50 employees, regardless of the number of plants in the firm. But startups and shutdowns are negligible for plants with 1,000 or more employees, except in single-unit plants.

Job Flows Between Firms

Job flows between multiplant firms constitute less than 60 percent of the total job flows between plants owned by these firms, as shown in the four right-most columns of Table 3. A significant portion of the job flows between these plants occurs within firms, as firms reshuffle jobs

[19] It is true, however, that the modest employment changes in manufacturing contrast with the healthy increase in overall U.S. employment, so the *share* of manufacturing employment has declined significantly even though the *level* has not.

between plants which they own.

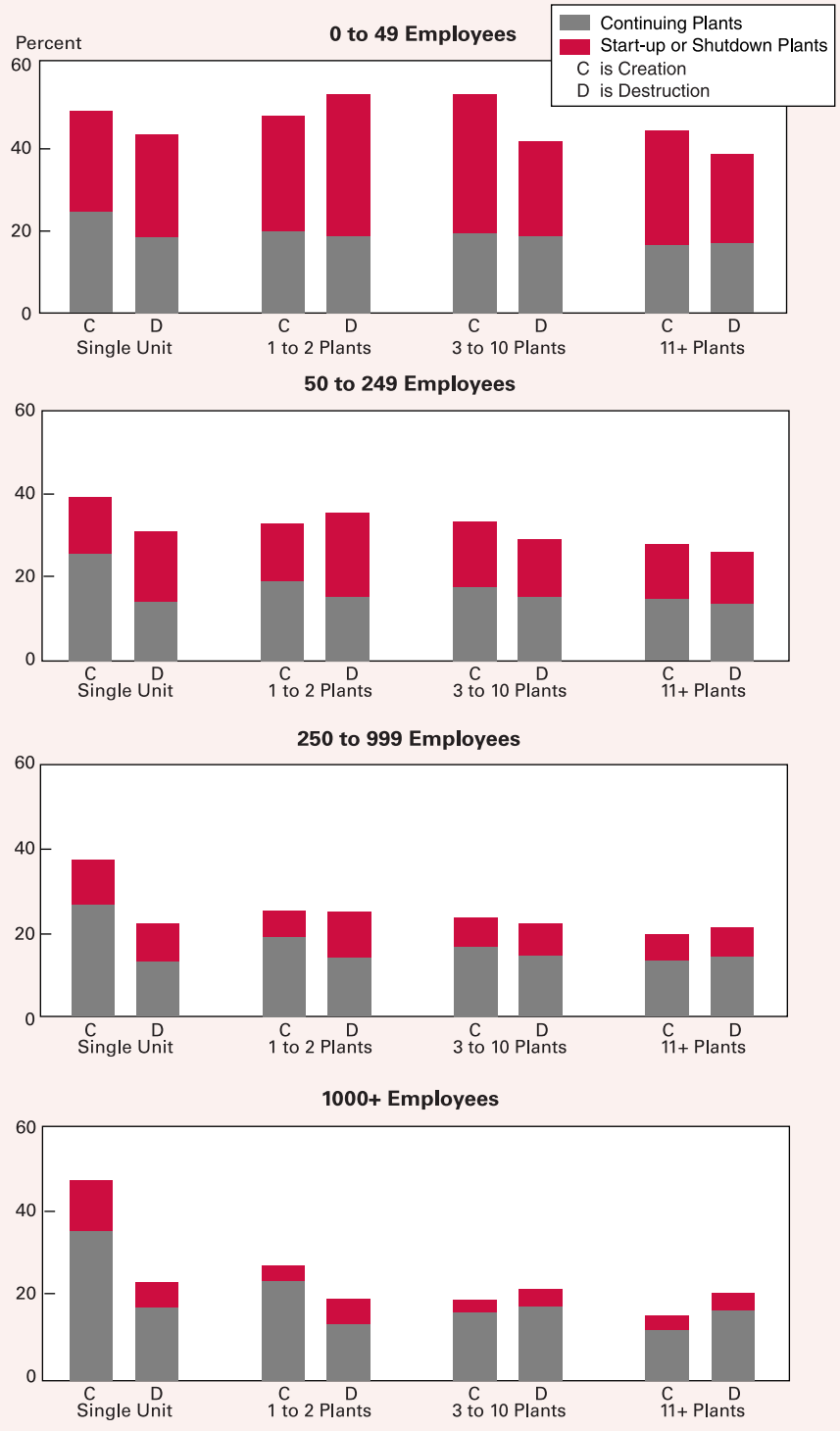
For the total manufacturing sector, including single-plant firms, approximately three-fourths of job flows between plants are also between firms, with the shares roughly the same across flow types. The fact that most of the job flows occur between firms is not entirely surprising. By definition, all job flows between plants owned by single-plant firms occur between firms. And while less than one-third of employment is in single-plant firms, those firms account for a disproportionate share of job creation and destruction.

The share of job flows between firms declines dramatically as the number of plants in a multiplant firm increases. Table 3 and Figure 8 show that a little more than half of all plant-level job flows in multiplant firms occur between firms. But job flows between firms account for nearly 90 percent of all flows in firms with only 1 to 2 plants, whereas the number is only about 40 percent or less for firms with 11 or more plants. The decline is particularly large for excess reallocation, as Figure 8 shows.

To some extent, the decline is not surprising. Obviously, the scope for job reallocation within a firm increases with the number of plants in the firm. A firm with 15 plants may keep employment constant over a five-year period, but employment at some of its plants almost surely would increase or decrease; a firm operating two plants is less likely to experi-

Figure 7

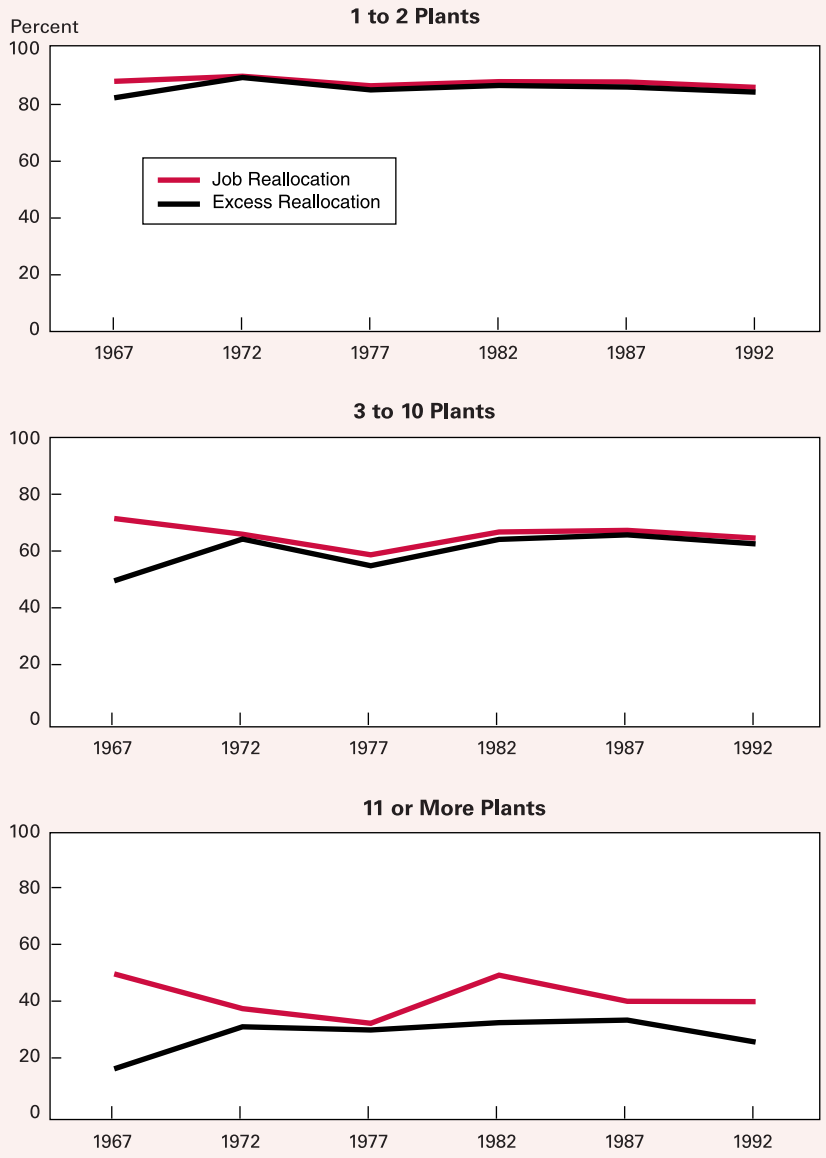
Job Creation and Destruction in Manufacturing Plants by Plant Size and Firm Type: Quinquennial Averages, 1967 to 1992



Source: Authors' tabulations from the Longitudinal Research Database (LRD).

Figure 8

Job Reallocation between Firms as a Percentage of Total Job Reallocation between Plants: Quinquennial, 1967 to 1992



Source: Authors' tabulations from the Longitudinal Research Database (LRD).

ence simultaneous job creation and destruction at its plants.

However, the magnitude of the decline is remarkable. For the very largest multiplant firms, it appears that job reallocation within these firms may account for a majority of their total job flows. In other words, a majority of the job creation and job destruction at the average large (11+ plants) multiplant firm serves to adjust the distribution of employment across plants owned by the firm, rather than to adjust the firm's level of employment. Combined with the fact that total job flow rates for large firms are relatively small, the small percentage of flows between firms implies that the job flow rates between large multiplant firms are radically smaller than are the rates between small firms.

Excess reallocation between large firms is remarkably small. Recall that excess reallocation measures jobs created or jobs destroyed in excess of what is needed to achieve the observed change in employment within a sector. Table 3 shows that excess reallocation between plants is itself quite low for large (11+ plants) firms. During a typical five-year period, the jobs created and destroyed by single-plant firms, in excess of what would have been needed to achieve the actual change in employment in the single-plant firm manufacturing sector, averaged a little over 70 percent of employment in that sector. The equivalent figure for plant-level excess reallocation by plants owned by large firms is less than half as large, 34 percent. However, in both cases at least 80 percent of total job reallocation is excess reallocation.

The between-firm share of excess reallocation for large firms (at least 11 plants) is only 0.29, which implies that about 70 percent of excess job reallocation at plants owned by large firms may be accounted for

by the reshuffling of jobs within firms. Thus, the between-firm excess reallocation rate at large firms averages less than 10 percent. Put another way, over a typical five-year period, jobs created or destroyed at the firm level in excess of what was needed to achieve the actual change in net employment averaged only 10 percent of employment for large firms as a group. This is quite a low rate, especially compared to the 71 percent rate at single-plant firms. It is also interesting to note that between-firm excess job reallocation is only 56 percent of between-firm total job reallocation for large (11+plants) firms. The fact that the rate of excess reallocation is so low for large multi-plant firms implies that relatively little job reallocation occurs that is not tied to changes in the level of employment at multiplant firms as a whole. There is relatively little reshuffling of jobs between large multiplant firms.

The average large multiplant firm creates and destroys jobs primarily to adjust the distribution of employment across its plants within the firm, not to adjust the firm's employment.

Implications of the Evidence on Job Flows

A sharp contrast between single-plant firms and large multiplant firms emerges from the evidence. Single-plant firms churn jobs at incredibly high rates – all between firms, by definition. In contrast, large multiplant firms reallocate jobs between plants at a much lower rate, and a majority of the reallocation is *not* between firms. Furthermore, employment at single-plant firms has expanded over time, while employment at large multiplant firms has shrunk. These results clearly indicate that job creation and destruction are correlated with the structure of firms.

Our analysis also suggests the possibility of very different behavior of gross job flows over the business cycle among different types of firms. During a recession, firms often decrease their level of production and have the opportunity to retool plants or otherwise reallocate resources within the firm without disrupting production. For this reason, the opportunity cost of restructuring may be lower during a recession than during an economic expansion for many firms. This would be especially true for large multiplant firms, which have greater scope for intrafirm resource reallocation than do single-plant firms. During the course of a recession and subsequent economic recovery, we might expect to see a considerable degree of permanent plant-level job reallocation within large firms, but a much smaller level of between-firm job reallocation. While the plant-level job flow rates of multiplant firms are much smaller than those for single-plant firms, they may prove to be more cyclically sensitive. This would be consistent with evidence on the cyclical sensitivity of job flows by plant size presented by Schuh and Triest (1998).

V. Summary and Conclusions

This article documents the structure of firm organization in U.S. manufacturing and provides new evidence on the role of firms in the processes of job creation and destruction. As one moves along a continuum of firm size from small single-plant firms to large multiplant firms, the increase in average plant size, geographic diversity, and product diversity is marked, but a sharp drop-off in gross job flow rates also occurs. Most job flows are between firms for small firms, but intrafirm flows dominate for very large firms. Most plants are in volatile small firms, but employment is concentrated mainly in relatively stable large firms.

Previous research on gross employment flows has tended to emphasize the huge magnitude of the flows, suggesting a labor market in constant flux. The results in this article do not contradict this previous research, but suggest a more nuanced view. Small firms do have very high rates of job creation and destruction, much due to plant startups and shutdowns. Large firms have relatively low rates of job creation and destruction, with relatively few of the job flows associated with plant startups and shutdowns. And much of the job creation and destruction in plants owned by the large firms is associated with firms reshuffling jobs between plants which they own. While the small-firm sector does seem to be in constant flux, the large manufacturing firm sector appears to operate in a relatively steady, and perhaps planned, fashion.

This article raises as least as many questions as it answers, a number of which we plan to address in future research. One prominent issue we plan to study

is the role of firms in the reallocation of employment over the business cycle. Do large multiplant firms use recessions as an opportunity to reallocate their resources across plants, or does their access to broader capital and product markets result in their job reallocation being less cyclically sensitive than that of small firms? Another issue is the role of intrafirm job reallocation in the redistribution of manufacturing employment across regions of the United States. Is the decline of manufacturing employment in the older northern industrial regions associated largely with firms in those regions themselves declining, or are firms instead reallocating jobs from the Rust Belt to the Sun Belt?[20] We also plan to study the role of reallocation within firms in the process of firm growth. For example, what is the role in firm growth of reallocation to lower-cost plants and more profitable industries?

[20] Our preliminary research on this topic is reported in Schuh and Triest (1999b).

Acknowledgments

The authors thank Katharine Bradbury, Lynn Browne, Jeffrey Fuhrer, and Joanna Stavins for helpful suggestions. Joshua Congdon-Martin and Catherine Humblet provided excellent research assistance. The research in this paper was conducted while the authors were Census Bureau research associates at the Boston Research Data Center. Research results and conclusions expressed are those of the authors and do not necessarily indicate concurrence by the U.S. Bureau of the Census, the Federal Reserve Bank of Boston, or the Board of Governors of the Federal Reserve System. This paper has been screened to ensure that no confidential data are revealed.

References

Acs, Zoltan and Catherine Armington. 1998. "Longitudinal Establishment and Enterprise Microdata (LEEM) Documentation." *Center for Economic Studies* Working Paper No. 98-9, U.S. Bureau of the Census, July.

Davis, Steven J. 1990. "Size Distribution Statistics from County Business Patterns Data." Unpublished paper.

Davis, Steven J., John C. Haltiwanger, and Scott Schuh. 1996. *Job Creation and Destruction*. Cambridge, MA: The MIT Press.

Dunne, Timothy, Mark Roberts, and Larry Samuelson. 1989. "Plant Turnover and Gross Employment Flows in the U.S. Manufacturing Sector." *Journal of Labor Economics*, 7(1), pp. 48–71.

Haltiwanger, John and Scott Schuh. 1999. "Gross Job Flows Between Plants and Industries." *New England Economic Review*, March/April, pp. 41–64.

Schuh, Scott and Robert K. Triest. 1998. "Job Reallocation and the Business Cycle: New Facts for an Old Debate." In Jeffrey C. Fuhrer and Scott Schuh, eds., *Beyond Shocks: What Causes Business Cycles?* Federal Reserve Bank of Boston Conference Series No. 42, pp. 271–337.

———. 1999a. "Gross Job Flows and Firms." *Proceedings of the American Statistical Association*, Government Statistics Section, forthcoming.

———. 1999b. "Gross Job Flows Between and Within Regions." Unpublished working paper.

U.S. Bureau of the Census. 1979. "The Standard Statistical Establishment Program." *Bureau of the Census Technical Paper* No. 44 (January). Report prepared by the Economic Surveys Division.