THE IMPACT OF OWNERSHIP CHANGE ON EMPLOYMENT, WAGES, AND LABOR PRODUCTIVITY IN U.S. MANUFACTURING 1977-87

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Abstract

This paper reports on the impact of ownership change on productivity, wages, and employment in U.S. food manufacturing for the period 1977-87. Our analysis is based on both firm and plant level data taken from the U. S. Census Bureau's Longitudinal Research Database (LRD). Three principal results emerge from the analysis. First, ownership change is positively associated with productivity and wage growth, although the effects are significantly smaller for large plants. Second, ownership change appears to be associated with increases, not decreases, in employment at operating plants. Third, plants changing ownership show a greater likelihood of survival than those that do not change owners. These findings run counter to the notion that mergers and acquisitions cut wages and reduce employment. Finally, neither of the first two results are observed when firm level data are used for the analysis. This suggests that firm level data hide important dynamic activities within the firm. Thus, plant level data are necessary for studying the structure and performance of firms over time.

Keywords: ownership change, employment, wages, labor productivity

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I. INTRODUCTION

In this paper, we examine the effects of ownership change on productivity, wages, and patterns of employment in manufacturing production facilities at both the firm and establishment levels of detail. The analysis relies on longitudinally linked plant data from the food manufacturing industry for the period 1977-87. These data allow us to take a fresh look at the relationships between ownership change and labor market outcomes.

There are few empirical studies assessing the linkages between ownership change and wages and job mobility. This is because empirical work has been hampered by a lack of appropriate data.[1] Until very recently, most labor research was carried out almost exclusively with household data because longitudinal establishment-firm data were not available. These data limitations were greatly mitigated once the Longitudinal Research Database (LRD) was established at the U.S Census Bureau's Center For Economic Studies (CES).[2]

In this study, we use plant level data, taken from the LRD, to examine the impact of ownership changes during the 1977-87 period on productivity, wages, and employment in U.S. manufacturing. These data allow us to construct a dataset

containing firms undergoing ownership changes involving control, and comparable groups of firms not experiencing such changes. Moreover, the LRD makes it possible to determine the composition of each firm at discrete 5 year intervals. In particular, output, employment, productivity, and other information for each plant owned by the firm can be obtained. This allows categorization of the firm at the beginning of a period into plants that operate continuously, those that close, and those that are sold to other firms. Similarly, the plants of a particular firm at the end of the period can be broken down into those the firm originally owned, those it acquired from another firm, and those that are newly constructed. We shall discuss in some detail the longitudinally linked firm-establishment dataset we have constructed from the LRD.

While changing ownership itself is not necessarily associated with other changes in the operation of the firm, ownership changes involving "control" -- the type of transaction examined here -- typically lead to operational changes.[3] Some ownership changes -- hostile takeovers, for example -- derive their notoriety from the wholesale upheavals that often accompany them: management dismissal, plant closures, abrogation of pension benefits, and wage reduction. Even though hostile takeovers are <u>not</u> typical of ownership change transactions, other forms of ownership change, such as friendly mergers, also lead to significant operational changes.

Despite strong opposition from labor unions and widespread, often negative, press reports on ownership changes, there are few studies of the effects of ownership change on labor. To our knowledge, there have been only two published studies that focus on this issue. The first, by Brown and Medoff (1988), used a sample of mostly small firms from one state, Michigan. Brown and Medoff identified three categories of ownership changes in their sample: (i) "Simple sale" in which a firm changes ownership without being integrated with any other firm, (ii) "assets-only sale" where one firm acquires some of the assets of another firm, and (iii) "merger" where one firm purchases another firm. They find that assets-only sales led to a five percent decrease in employment and a five percent increase in wages. In contrast, mergers and simple sales resulted in an increase in employment and a reduction in wages. Because only one third of their sample were assets-only sales, Brown and Medoff's results suggest that, except for divestitures, ownership changes have little impact on employment and the average wage.

The second study, by Lichtenberg and Seigel (1992b), focused on the impact of ownership change on wages and employment in auxiliary (central office) establishments. They found ownership change associated with reductions in both wages and employment in central offices, but little effect in production plants. Since the chief operating officer's salary is a large component of the average wages in small firms, the Brown and

Medoff results appear to be consistent with those of Lichtenberg and Siegel. In short, these studies suggest that managers and white collar workers suffer the most following ownership change; but, overall, the effects on labor, particularly production workers, appear to be relatively small.

Brown and Medoff (1988) suggest that much of the press and labor union concern with ownership change might stem from extensive media coverage of a small and highly selective group of transactions. The lack of clear theoretical links between ownership change and labor market outcomes is consistent with this view. For example, at first glance, the consequences for employment of ownership changes to create market power appear clear: market power is exercised by reducing output and raising prices; and reduced output will unfavorably affect employment. But this is not the whole story. First, because of antitrust enforcement, monopoly takeovers account for only a small proportion of observed mergers in the past twenty or thirty years. Second, even in the absence of antitrust enforcement, it is not clear how "labor" would react to a merger for monopoly. A strong union reasonably might be expected to share in the monopoly rents.

As another example, many have argued that the dominant incentive during the conglomerate merger wave of the late 1960s to early 1970s was empire-building by managers who were not operating in shareholders' interests (Mueller, 1969 and 1993;

Shleifer and Vishny, 1989). The merger wave of the 1980s has been viewed as a response to the managerial excesses of the conglomerate merger wave in the earlier period. In this view, the acquisitions of the 1980s were motivated by the gains available from replacement of inefficient managers of poorly performing firms. (Jensen and Ruback, 1983; Lichtenberg, 1992; Jensen, 1993). Arguably, the net effect of such shifts on aggregate productivity (and thus wages) and jobs is relatively small.

The foregoing discussion offers an a priori reason for skepticism concerning the importance of ownership changes for labor markets. However, even if the aggregate net effects of ownership changes are small, the reallocations of jobs and workers associated with them can be substantial. Reallocations are an important ingredient in the shift of resources from lower to higher valued uses: as shown in Baily, Campbell, and Hulten (1992), this process -- shifts of jobs from lower to higher productivity plants -- is extremely important to aggregate productivity growth.

Our analysis leads to the following principal findings: (1) relative labor productivity and wages of acquired plants grew faster than those at plants owned by non-acquiring firms, although the effects are significantly smaller for large plants; (2) acquired plants tend to increase their employment faster than that of their counterparts owned by non-acquiring firms; (3)

plants that changed ownership are less likely to close than those that did not. These results suggest that the typical motive for ownership change is improvements in operating efficiency, and that these improvements are not primarily obtained through downsizing and reduced wages. Rather, acquisition typically results in improved productivity and growth for acquired plants. This, in turn, leads to higher wages and employment. We also find that these results -- based on plant level data -- are not obtained when firms are used as the unit of analysis. The last finding indicates that firm level data hide important activities within the firm. Thus, plant level data are needed for studying changes in the structure and performance of the firm over time.

We discuss the relationships among ownership change, productivity, wages, and employment in Section II. In Section III, we describe the data. In particular, we discuss how the LRD data were used to identify ownership change. In Section IV, we report some simple statistics describing the characteristics of firms and plants experienced ownership change. Our regression analysis is discussed in Section V. Section VI reports the regression results. Discussions of the results are presented in Section VII. The last section proposes directions for future research and concludes the paper.

II. OWNERSHIP CHANGE, PRODUCTIVITY, AND EMPLOYMENT

Recent studies using longitudinally linked firm-establishment data in the LRD find a significant, positive relationship between ownership change and plant productivity growth for the 1980s merger wave. For examples, Lichtenberg and Seigel (1992a), and McGuckin and Nguyen (1994a) conclude that ownership changes are positively associated with productivity growth in the U.S. manufacturing sector. Baldwin (1991) obtains a similar result using Canadian establishment data. These results are in sharp contrast with those found by previous researchers whose samples typically consisted of data for large firms.[4] As discussed in more detail below, the new microdata appear to have uncovered relationships "hidden" in the more aggregative firm data.

The positive association between productivity growth and ownership change is consistent with most merger theories.[5] A key issue is the source of the gains. For example, one leading hypothesis is that ownership changes are undertaken for managerial-discipline reasons. Managerial-discipline takeovers are generally associated with poorly performing businesses that can be re-organized and re-structured to make them more productive. The importance of this motive for ownership change is supported empirically by Lichtenberg (1992). In addition, Lichtenberg and Siegel (1992b) find evidence supporting the hypothesis that ownership changes lead to the elimination of jobs: downsizing and lower wages for central offices in firms

undergoing ownership changes. But Lichtenberg and Siegal find little in the way of employment effects at production plants. Thus, they do not find that ownership change is associated with losses of manufacturing jobs.

McGuckin and Nguyen (1994a) reject the managerial-discipline theory as a broad-based explanation of most ownership change. They reach this conclusion because their data show that it is high, not low, productivity establishments that are most likely to experience ownership change. Matsusaka (1993a), and Ravenscraft and Scherer (1987) report similar results: corporate acquirers generally purchase good businesses (productive plants) rather than bad businesses. This suggests that the gains in most ownership changes are associated with efficiencies generated by synergies, which are a result from combining operations.

For a subset of large establishments, McGuckin and Nguyen (1994a) find -- consistent with Lichtenberg and Siegel (1992a) whose sample consisted primarily of larger plants -- that establishments changing owners have low initial productivity and they improve following the ownership change. Thus, for very large establishments, managerial-discipline motives for ownership change apply. Matsusaka (1993b) draws a similar conclusion for the 1960s and 1970s, using firm-level data and a somewhat different test.

Despite the new evidence that a substantial proportion of the observed ownership changes represent combinations of

efficient operations and subsequent improvements in productivity performance, the impact of ownership change on employment cannot be distinguished on theoretical grounds alone. It is possible for the positive association between ownership change and productivity growth to arise in ways that will, on net, have little effect on total employment of the firm. Productivity improvements could come from efficiencies leading to growth, upsizing the firm and increasing employment, rather than through downsizing. But, even when synergies are the dominant motive for the ownership change, downsizing is possible.

Similarly, one can expect either increases or decreases in wages following ownership changes. Ownership changes leading to productivity increases will tend to increase wages unless all of the rents from the ownership reorganization accrue to management. The relatively small gains to acquiring firms' shareholders found in finance studies are consistent with the view that all the rents do not accrue to acquiring firms. On the other hand, the large premiums paid to acquired firm shareholders suggest that labor is not a primary recipient of owner reorganization rents. Even in the absence of rents to labor, however, the average wage could increase if ownership change is associated with shifts to higher distributions of worker skills.[6]

To sort out these issues, we turn to a plant-level data set that covers both acquiring and non-acquiring firms, and examine

the relationships among ownership change, productivity, wages, and employment at both the firm and establishment levels.

III. DATA DESCRIPTION AND SOURCES

A. Data Source: The LRD

The data used in this study are taken from the LRD which contains data on output, employment, and costs for individual U.S. manufacturing establishments. The output data include total value of shipments and value added. Data on costs include information on capital, labor, energy, materials, and selected purchased services. The employment data contain total and production workers, and their wages, as well as worked hours for production workers.

An important feature of the LRD is its plant classification and identification information: These include firm affiliation, location, product and industry, and various status codes which identify, among other things, birth, death, and ownership changes. These identifying codes are used in developing both the longitudinal plant linkages and ownership linkages among plants.[7]

B. Identifying Ownership Changes in the LRD

In the LRD, a firm identification variable -- the "ID" taken directly from basic economic census records -- includes information on a plant's ownership. The ID also identifies whether a plant is part of a single or multi-unit firm in a

particular year. For multi-unit (MU) firms the ID associated with the plant is a ten digit number with the last four digits representing a permanent plant number. Single-unit (SU) firms have a nine digit ID.

Over time, the ID numbers of particular plants can change. An ID change can indicate ownership change, but it can also indicate other things as well. For example, a shift of a plant from SU to MU status will cause the plant's ID to change. (More detail is given in Appendix A.)

To identify ownership changes in the LRD requires three steps: (i) identify plants that change firm ID between two census years, (ii) within this set of plants, use certain codes in the LRD, called coverage codes, to identify directly a subset of plants that change ownership, and (iii) from the remaining plants, indirectly identify further ownership changes.

Ideally, all new firm IDs and CC codes would be recorded during the years that establishments change status (including ownership), so that it would be easy to identify ownership changes. In practice, this does not always happen. Except for large establishments, neither changes in ID nor proper CC codes are always recorded during the years of status change. In many cases, a change in firm ID may appear one or more years before the corresponding CC code change occurs to explain the reason for the ID change. Also, for a large number of SU establishments, proper CC codes were not assigned at all.

To find ownership changes among the group of plants with unexplained ID changes, we brought together initial and ending IDs for all plants that were owned by the firms in our sample. For example, suppose the LRD shows that plant A belonged to firm X in 1977 and to firm Y in 1982, but the 1982 CC code for plant A does not show this as an ownership change. But suppose we know that firm Y also acquired at least one other plant belonging to firm X between 1977 and 1982 (Firm Y may also have sold or closed plants as well.) In this case, it is likely that firm Y bought plant A as well, and we code plant A accordingly.

Using imputation procedures of this type, we were able to identify 4,400 manufacturing plants with ownership changes among the 5,550 ID changes which had no CC code in the LRD. Overall, 11,657 manufacturing plants -- 69% of all manufacturing plants with ID changes in the 1977-87 period -- were identified as ownership changes.

C. Data Coverage

We focus on the food manufacturing industry (SIC 20) because data for this industry at both the plant and firm level are "cleaned" and ready for this particular analysis.[8] Our sample covers all firms that had at least one plant operating in the food manufacturing industry in 1977, including both acquiring and non-acquiring firms. We examine ownership changes occurring

during the period 1977-82. There are several reasons for focusing on ownership changes occurring in this period.

First, the period encompasses two Censuses of Manufactures so that we are confident of correctly identifying all ownership changes. In non-census years information is available only for a sample of plants. Second, the period includes the beginning years of the latest merger movement that extended until 1986 or 1987. Third, our performance measures avoid the influence of the cyclical trough that ended in 1982. Fourth, and perhaps most important, studying ownership changes between 1977 and 1982 allows us to evaluate the performance of firms and plants 5 to 9 years after the transaction. This provides plenty of time for the acquiring firm to integrate purchases into the firm, or to dispose of them.

Using the firm IDs we identified all food manufacturing plants owned by both acquired and acquiring firms in the LRD. This provides our population of acquired plants and firms, as well as that of acquiring firms having operations in the food manufacturing industry during the period. For the period 1977-82, we identified 733 firms that sold at least one food manufacturing plant. These firms sold totally 2,113 plants (including 1,575 food plants and 538 non-food plants) to 732 acquiring firms. The acquired food plants amounted to 38,764 million dollars in value of shipments, which accounted for 20.8 percent of the 1977 total value of shipments of the entire food

manufacturing industry (SIC 20). After acquisition, 949 acquired plants (44.9 percent) remained with the acquiring firms, 746 plants (36.2 percent) were closed, and 400 (18.9 percent) plants were resold to other firms.

The 732 acquiring firms consist of 93 SU firms, 284 new MU firms, and 355 MU existing firms. Of the 284 new MU firms, 134 entered manufacturing by acquiring only one manufacturing food plant. Each of the remaining 150 non-manufacturing firms acquired at least two or more plants. The 355 MU manufacturing firms played an important role in the 1977-82 acquisition movement in the food manufacturing industry. They acquired 1,455 of 2,113 transferred plants (68.9 percent), which accounted for 37,435 of the 38,764 millions dollars total value of shipment acquired (98 percent). Of the remaining 658 plants, 93 plants were acquired by 93 SU firms, 134 plants were acquired by 134 non-manufacturing firms, and 431 plants were sold to 150 other non-manufacturing MU firms.

For the non-acquiring group, we identified 17,409 firms that had at least one food manufacturing plant in 1977. Of the 17,409 firms, 15,062 were SU firms, 1,185 non-manufacturing firms having one food manufacturing plant, and 1,157 were MU manufacturing firms. These 1,157 firms owned 7,701 manufacturing plants (both food and non-food plants) in 1977.

Thus, our sample covers the entire 1977 population of food manufacturing firms in the U.S. This population consists of

18,141 firms, of which 17,763 firms operated primarily in the food industry, and 378 firms operated primarily in other non-food industries. The 18,141 firms owned 30,086 plants in 1977, of which 23,980 plants were owned by food firms and 6,106 plants were owned by non-food firms.

D. Variable Measurement

The main variables used in this study are employment, wages, and productivity.

Employment and Wage Variables: Employment is measured by the total number of employees which consist of production workers and non-production workers. Wages are defined as workers' annual salaries. We note that this measure of wages does not include non-wage costs associated with labor because separate data on these costs are not available for the two types of workers. In addition, Dunne and Roberts (1993) found that "non-wage costs are a poorly reported variable in the census data ... many of the plants have this variable imputed ..." (p. 7). Following Dunne and Roberts, we do not include non-wage costs in the measurement of wages. Real wages are defined as nominal wages deflated by the consumer price index taken from the Survey of Current Business (September, 1993).

Productivity Measurement: We use value of shipments rather than value-added as a proxy for output in our productivity measure because data on value-added are not always available,

particularly for small plants. In practice, productivity results using either measure are highly correlated. For example, the results in McGuckin and Nguyen (1994a), which also used food industry data over this period, were unaffected by the choice of value-added or shipments. (See also Baily, Campbell, and Hulten, 1992; and Baily, Bartelsman, and Haltiwanger, 1994).

Productivity can be measured either for each single input such as labor (the well-known labor productivity, LP) or for all inputs, total factor productivity (TFP). Theoretically, TFP is the appropriate measure of productivity because it takes into account all inputs. In practice, labor productivity is often used because data on inputs, such as capital, that are required for the measurement of TFP are not available. Because of data limitations, we base our analysis on labor productivity.[9]

Plant LP is measured as value of shipments in current dollars divided by the total number of employees. While output prices and value of shipments vary across plants and over time because of price dispersion and inflation, deflating each plant's LP by its industry average LP produces a comparable productivity measure through time.[10] We call this adjusted LP measure relative labor productivity (RLP).

Plant RLP provides a good measure of plant performance if all plants in the same industry have similar input-output ratios. If the production technology differs substantially among plants, RLP could be a misleading measure of performance. However, in

our earlier work (McGuckin and Nguyen 1994a), we estimated TFP for a number of large plants for which the required data were available. We then compared the TFP results to the RLP results, and found that both measures led to the same conclusions regarding plant performance.

While SU firms are classified in a single industry, MU firms often have plants operating in various industries. For MU firms, we calculate the productivity for each plant separately, then obtain the firm productivity as a weighted sum of plant productivities. Thus, we measure the RLP of the firm by

$$RLP^F_k = E^n_j \; w_{kj} RLP_{kj} \qquad (1)$$

where RLP^F_k is RLP of firm k, the weight w_{kj} is the ratio of plant j's employment to the total number of employees of firm k, and the summation is over the n plants of firm k.

IV. DESCRIPTIVE STATISTICS

The Food Manufacturing Industry

1. Firm-Level Data. Table 1 presents 1977 and 1987 wages, productivity, and total employment for all firms operating in the food industry during the period under study. We classify acquiring firms into four groups: (1) SU firms, (2) MU non-manufacturing firms entering manufacturing by buying one food plant, (3) MU non-manufacturing firms entering manufacturing by buying more than one food plant, and (4) MU manufacturing

acquiring firms. Non-acquiring firms are classified into three groups: (1) SU firms, (2) non-manufacturing MU firms having only one plant operating in the food manufacturing industry, and (3) MU manufacturing firms having at least one plant operating in the food manufacturing industry.

While we report data on all types of firms, we focus our discussion on MU manufacturing firms because they accounted for most activities in the food industry. In both 1977 and 1987, MU manufacturing acquirers accounted for more than 91 percent of the total number of workers employed by all firms that acquired at least one food plant during the 1977-82 period. As for non-acquiring firms, MU manufacturing firms accounted for 77.6 percent and 80.0 percent of all workers employed by all non-acquiring food producing firms in 1977 and 1987, respectively.[11]

Considering employment first, Table 1 shows a striking difference in employment growth between acquiring and non-acquiring surviving firms. The average employment size of MU manufacturing acquiring firms increased by 37.3 percent from 3,649 employees in 1977 to 5,011 employees in 1987, whereas the average size of non-acquiring MU manufacturing firms declined by 7.6 percent during the same period (from 1,570 in 1977 to 1,451 employees in 1987). By 1987, the 268 surviving MU acquiring firms employed totally 1,343,051 workers, approximately 12 percent above the total employment of the 1977 cohort of 355 acquiring firms (1,202,734 workers), and 37.3 percent above the

977,878 workers they employed in 1977. In contrast, by 1987 the 667 surviving MU non-acquiring firms employed 967,793 workers, about a 7.6 percent decline from their 1977 employment level, and well below the 1,252,848 workers employed by the 1977 cohort of 1,157 firms that did not change owners during 1977-82.[12]

Turning to wages, we find that, on average, MU firms paid the highest wages. MU acquiring firms paid their typical worker $22,439 (in 1987 dollars) per year in 1977 and $23,235 per year in 1987, a 3.6 percent increase in real wages. MU non-acquiring firms paid their typical worker $20,940 per year in 1977 and $22,142 in 1987, a 5.7 percent increase.[13]

Regarding productivity, we find that firms having the highest initial productivity survived, while those having the lowest initial productivity were closed. Firms that were sold had above average levels of productivity, but their productivity levels were well below those of surviving firms and above those of closed firms. Acquiring firms had higher productivity levels than non-acquiring firms in both 1977 and 1987. The 1977 and 1987 productivities of acquiring firms were 1.14 and 1.08, while those of non-acquiring firms were 1.00 and 1.02, respectively. These figures, however, show that acquiring firms experienced a decline in relative productivity, while non-acquiring firms showed productivity improvement during the 1977-87 period.

In summary, the firm data for the food industry show that acquiring firms employed more workers, paid higher wages and were

more productive than non-acquiring firms. While acquiring firms were highly productive, their relative productivity declined by 5.6 percent from 1977 to 1987. In contrast, non-acquiring firms were less productive, but their relative labor productivity improved by 2.0 percent during the same period.

Table 1 provides a picture of the characteristics and performance of acquiring and non-acquiring firms, but what is not clear is how acquisitions actually affect firms' productivity, employment, and wages. For example, Table 1 shows that acquiring firms increased their employment substantially during the 1977-87 period, but it is not clear whether this increase came from upsizing existing plants or acquired plants, or simply from opening new plants. In a similar vein, the decline in productivity of acquiring firms could come from the diminishing productivity of old existing plants and productivity levels of acquired plants below the firms averages or from a decline in productivity of acquired plants. It is imperative to turn to plant-level data and examine the performance of the different components of the firms to understand how their composition impacts the observed firm-level results.

2. Plant-Level Data. Table 2 reports productivity, total employment, and wages of individual components of the two groups of firms in 1977 and 1987. Columns 1 and 2 show that, except for plants purchased during 1983-87 by acquiring firms from the 1977-82 period, all purchased plants show improvement in relative

productivity by 1987. Specifically, plants purchased during 1977-82 and kept through 1987 by acquiring firms increased their productivity by 4 percent (from 1.02 in 1977 to 1.06 in 1987). Plants purchased by (1977-82) non-acquirers during 1983-87 also increased their productivity by 2 percent (from .95 in 1977 to .97 in 1987).

In contrast, the relative productivity of plants initially owned and kept until 1987 by both groups of firms declined noticeably: a 6 percent decline for plants owned by acquirers (from 1.18 in 1977 to 1.11 in 1987) and a 5 percent decline for plants owned by non-acquirers (from 1.04 in 1977 to .99 in 1987). Finally, new plants opened by both acquiring and non-acquiring firms showed 1987 productivity well above that of existing and purchased plants.

The above results suggest that there are two major sources of the decrease in relative productivity observed for acquiring firms. The first is the decline in the relative efficiency of older plants initially owned by acquiring firms. The second is the lower productivity of the plants purchased by acquirers: while acquired plants experienced a noticeable improvement in productivity, their 1987 productivity levels were still below those of old (1977 kept plants) and new plants. Inclusion of these "below average" plants lowers a firm's average productivity.

New plants built by both acquirers and non-acquirers during 1978-82 had the highest level of productivity. For non-acquirers these high productivity new plants were able to offset the decline in the relative efficiency of their older plants. However, in the case of acquiring firms, the high productivity of new plants could not compensate for the relative efficiency decline arising from the lower levels of productivity in acquired plants. Thus, even though acquired plants became more productive after acquisitions and new plants were highly productive, the firm-level relative productivity of acquiring firms fell.

Turning to employment, Columns 3 and 4 show that both acquiring and non-acquiring firms were very active in re-structuring by selling and buying plants, building new plants, and closing old plants. But, acquiring firms increased their employment while non-acquiring firms showed decreases in the period 1977-87. The reason for this difference is that acquiring firms increased their employment by acquiring and building plants more than they decreased their employment by closing and selling plants. In contrast, non-acquiring firms closed and sold more plants than they built. One of the reasons that the surviving acquiring firms show good job performance is that they include the employment of sold firms which they acquire. As shown in Table 2, this source of growth for acquiring firms is substantial. But even taking this source of employment into account does not alter the conclusion that ownership change is

associated with employment increases. Unlike acquirers that hired more workers for their existing plants, non-acquiring firms cut employment in their existing plants. Taken together, the net employment gain for plants purchased by acquirers during 1977-87 was 16,238 workers (from 602,977 workers in 1977 to 619,215 workers in 1987).

Finally, Columns 5 and 6 report the annual wages of individual components of the firms under study. In general, plants owned by acquiring firms paid higher wages than those owned by non-acquiring firms. This is expected because, on average, acquirers' plants were bigger and more productive than non-acquirers' plants. But the differences across the various categories are not large in either 1977 or 1987. While both surviving acquiring and non-acquiring firms show increases in real wages in all their components, the observed increases are small, ranging from 2 to 7 percent over the 10 year interval.

These statistics suggest that ownership change had positive effects on both employment and productivity growth during the period under study. For wages the difference between the two groups appears much smaller. However, one should not draw conclusions based on these simple averages alone. Indeed, averages can be seriously misleading because they do not control for the effects of factors other than ownership change. Among other things, these factors include the firm's initial conditions such as size, wages, technology, and the industry in which the

firm operated. For this reason, we turn to a regression analysis that allows us to assess the impact of ownership change on employment, wages, and productivity while controlling for possible effects of other factors.

V. REGRESSION ANALYSIS

To control for the effects of factors other than ownership change, we run regressions in which changes in employment, wages, and productivity are the dependent variables. Ownership change and several predetermined variables are used as explanatory variables. We report our results based on simple regressions for change in each of the dependent variables and a probit regression designed to assess the likelihood that ownership change is associated with plant closures. Clearly all these variables are determined jointly and without a structural model, including good instrumental variables, we are limited in what we can say about causality. Nonetheless, we think this exercise is an instructive first step in understanding the role of ownership change on labor markets.

We specify our wage and employment equations as

$$\ln X_{87} - \ln X_{77} = a_o + a_1 OC_{77\text{-}82} + a_2 \ln W_{77} + a_3 \ln E_{77} + a_4)TECH + a_{12} OC_{77\text{-}82} * \ln E_{77}, \quad (2)$$

where ln is natural logarithm; X denotes total employment (number of workers, E) or wage rates; W is the annual wage rate; OC is a dummy variable (OC = 1 if the firm or plant experienced ownership change, otherwise OC = 0); and)TECH denotes change in technology of the firm or plant. We use the machinery and equipment to capital stock ratio as a proxy for the level of technology of the firm -- we assume that given the same level of capital stock, the firm that uses more equipment and machinery is more technologically advanced. While we recognize that this variable is not the best proxy for level of technology, it may be viewed as an adjustment to account for the fact that, other things equal, labor productivities will be higher in capital intensive plants.

The above wage and employment equations are similar to those used by Brown and Medoff (1988) and Lichtenberg and Siegel (1992b). They reflect specifications used in the literature analyzing the impact of training on workers' earnings and employment. The basic idea underlying the equations is to ask whether changes in ownership had significant effects on employment and wages controlling for the initial conditions (i.e., initial employment and wages). Our specifications differ in that we also include the variable)TECH and an interaction term, $OC77_{77\text{-}82}$* lnE_{77}, to allow interaction between OC and (employment) size. We do this because our data reveal that large firms (or plants) behave differently from small ones.

Similarly, our productivity change equation is specified as,

$$\ln RLP_{87} - \ln RLP_{77} = b_o + b_1 OC_{7782} + b_2 \ln RLP_{77} + b_3 \ln E_{77} + b_4)TECH + a_{13} OC_{7782} * \ln E_{77} + a_{23} \ln RLP_{77} * \ln E_{77}, \quad (3)$$

where RLP denotes relative labor productivity. Other variables are defined as above.

The regression analysis outlined so far is based on <u>surviving</u> plants: Each equation relates ownership change to changes in productivity, wages, and employment which are estimated using data on surviving plants. Thus, it is important to address the issue of plant closing or exiting after ownership change. To do so, we run probit regressions in which plant closing (PC) is the dependent variable. Ownership change (OC) is specified as an explanatory variable. We include initial relative productivity (RLP_{77}) and employment (E_{77}) as control variables. For comparisons, we also include the variable $OWNPLT_{AF77}$, which identifies whether the plant was originally owned by an acquiring firm in 1977 (the omitted category is plants that were owed by non-acquiring firms in 1977). Finally, we allow for non-linear effects of initial productivity and employment size on plant closure. Our probit regression is

$$PC_{87} = a_0 + a_1 OC_{77-87} + a_2 OWNPLT_{AF77} + a_3 RLP_{77} + a_4 \ln E_{77} + a_{13} OC_{77-87} * RLP_{77} + a_{14} OC_{77-87} * \ln E_{77} + a_{23} OWNPLT_{AF77} * \ln E_{77}$$

$$+ a_{33}(RLP_{77})^2 + a_{44}(\ln E_{77})^2 + a_{34}RLP_{77}*\ln E_{77}, \quad (4)$$

where PC_{87} equals 1 if the plant was closed by 1987; else it is equal to zero; $OC_{77\text{-}87}$ equals 1 if the plant changed ownership during 1977-87; else it is equal to zero; $OWNPLT_{AF77}$ equals 1 if the plant was owned by an acquiring firm in 1977; else it is equal to zero. The remaining variables are defined as before.

Before proceeding, we note that RLP_{77}, E_{77}, and W_{77} may reflect "transitory" rather than "initial" conditions of plants acquired during 1977-82. A better approach is using data on these variables several years before the plant being acquired to describe its initial condition. However, doing so requires continuous data, which in turn significantly reduce our sample size. Estimates based on such a truncated sample could lead to a serious sample selection bias. Nevertheless, in our preliminary work using data for the entire U.S. manufacturing sector, we used the average values of 1972 and 1977 data as a proxy for initial conditions of acquired plants [e.g., initial RLP = $(RLP_{72}+RLP_{77})/2$]. We find that the results based on this proxy are very similar to those based on using 1977 values alone.

VI. REGRESSION RESULTS

A. Firm-Level Results

Table 3 reports the firm-level results for the wage, employment, and productivity equations.[14] In each equation, the

variable ACQUIRER equals 1 if the firm is an acquiring firm; otherwise it equals 0. FOOD is a dummy variable having a value of 1 if the firm is a primary food producing firm; it is equal to 0 otherwise. The variable > is the residual estimated from the productivity equation (3). This variable is included in the wage equation to capture the possible effect of productivity on wages. We use > instead of the explicit productivity variable to avoid a potential simultaneity problem. It turns out that including >, FOOD, and)TECH in the equations does not significantly affect the estimated coefficients of the key variable ACQUIRER.

Considering first the wage equation results [Columns (1) and (2)], we find that the ACQUIRER coefficient is about -.09 to -.08 and statistically insignificant. This indicates that acquiring firms did not significantly reduce wages in the post-acquisition period. This result is consistent with the Brown-Medoff firm-level finding (1988) that the impact of acquisition on wages is small.

Columns (3) and (4) present the estimated coefficients for the employment equations. As with the wage equation, the coefficient for the ACQUIRER variable is unaffected by including the FOOD and)TECH variables. The coefficient for the ACQUIRER variable ranges from .459 to .466, but is statistically insignificant. This implies that acquisitions had a positive, but insignificant effect on employment. Thus, the results do not show evidence that acquiring firms reduced their work force.

Finally, Columns (5) and (6) show the estimated coefficients for the productivity change equations. Both the estimated coefficients for the ACQUIRER variable are negative, and those for lnE77*ACQUIRER are positive; however, all these coefficients are statistically insignificant, indicating that acquisitions did not have a significant effect on firms' productivity growth. The negative coefficients for ACQUIRER are consistent with the figures reported in Table 2 showing that the average productivity of acquiring firms declines from 1.14 in 1977 to 1.08 in 1987.

B. Plant-Level Results

The Wage Change Equation. Table 4 reports the coefficients for the wage equations estimated using plant-level data from the food industry.[15] The variable OC has a value of 1 if the plant had ownership change in either the 1977-82 or 1983-87 period; it is equal to 0 otherwise. In addition, we introduce two variables: OC7782 equals 1 if the plant had ownership change between 1977 and 1982 (OC7782 = 0, otherwise), and OC8387 equals 1 if the plant was purchased from 1983 to 1987 (OC8387 = 0, otherwise). $OWNPLT_{AF}$ equals 1 if the plant is initially owned by an acquiring firm in 1977 and operated through 1987; it is equal to 0, otherwise. The omitted category is non-acquiring firms' own plants. Other variables are defined as before. Equations (2), (4), an (6) use 4-digit industry dummies as control variables, while equations (1), (3), and (5) do not.

Columns (1) and (2) of Table 4 show the estimated coefficients for the linear model. The coefficient for the OC variable is negative and insignificant (Model I). It is only marginally significant when 4-digit industry dummies are incorporated into the model (Model II). With the non-linear models (Models III and IV), we find that the coefficient for OC becomes positive and highly significant and that the coefficient for $OC*lnE_{77}$ is significantly negative. The significance of the interaction term indicates that a non-linear model is more appropriate than the linear model, and hence interpretation of the results should be based on the estimates of the non-linear model. The estimates of Models III and IV indicate that the effect of ownership change on wages depends on the plant size. For smaller plant sizes, plants having ownership change tend to increase wages more quickly than plants not having ownership change, but for larger plants, the latter tend to increase wages faster. More specifically, the estimate of .387 for OC and -.089 for $lnE_{77}*OC$ (with the mean of lnE_{77} equal to 3.00) imply that on average plants having ownership change increase their workers' wages 12 percent [=.387 - .089(3)] faster than that of plants not having ownership change.[16]

Columns (5) and (6) show the estimated regressions in which we split acquired plants into two groups. The coefficients for OC7782 and OC8387 are significantly positive, and the corresponding interaction terms are significantly negative.

These estimates, again, indicate that except for a subset of large plants, plants having ownership change tend to increase wages more quickly than plants that did not change ownership. Using the coefficients of Model VI (Column 6) and keeping employment fixed at the mean, we find that, on average, plants acquired during 1977-82 and 1983-83 outperformed non-acquired plants in terms of wage growth by 9.2 percent and 15.3 percent, respectively. The)TECH variable had a significant positive effect on wages, and the coefficients for > are also positive and highly significant. This coefficient implies that a one percent increase in productivity is associated with about 0.27 percent increase in real wages.

The Employment Change Equation. Columns (1) and (2), Table 5, report the coefficients for the linear employment models, while the remaining columns show the coefficient for the non-linear model. The estimated coefficients for the OC variable in both linear and non-linear models are significantly positive, indicating that purchased plants' employment grew faster than that of non-acquired plants. Using the estimates of Model IV and fixing employment at the sample mean, we find that, on average, plants changing ownership during 1977-87 increased their labor force faster than plants that did not change ownership by 16.1 percent [i.e., .239-.026(3) = .161].

When we split the OC variable into two variables, OC7782 and OC8387, and control for the effects of industry, technical

change, and initial conditions, we find that the coefficient for OC8387 is positive and that for lnE_{77}*OC8387 is negative, and both coefficients are statistically significant. In contrast, the coefficients for OC7782 and its interaction term are insignificant (see Column 6). These coefficients imply that only plants changing ownership during 1983-87 increased their employments faster than plants without ownership change. The insignificant coefficient for $OWNPLT_{AF}$ (Column 6) suggests that the increase in employment in plants purchased during 1983-87 did not come from workers transferred from existing plants of the buying firms.

Productivity Change Equations. Table 6 reports the results for the productivity equation. As with the wage equation, the coefficient for OC is negative in the linear models (Columns 3 and 4). This coefficient, however, becomes significantly positive in the non-linear models (Column 3). The coefficient for the interaction term, lnE_{77}* OC, is also significant, suggesting that productivity growth is non-linearly associated with size and that the linear model may be misspecified.

Columns 5 and 6 show that the coefficients for OC7782 are significantly positive, indicating that productivity grew faster for plants changing ownership during 1977-82 than that of plants not experiencing ownership change. This result holds regardless of whether 4-digit dummies are incorporated in the regressions. The coefficients for OC8387 are negative and insignificant,

indicating that plants changing ownership just before 1987 did not perform better than other plants. These results are consistent with the data reported in Table 3 that the productivity of plants purchased during 1977-82 grew 4.0 percent (from 1.02 in 1977 to 1.06 in 1987), while that of plants changing owners during 1983-87 declined by 3.0 percent (from 1.01 in 1977 to .98 in 1987). One explanation for this is that it takes some time for acquiring firms to integrate with purchased plants. Thus, we place more credence on the results for ownership change in the 1977-82 period. Using the estimates of Model VI and fixing (log) employment at the sample mean, we find that productivity of plants changing ownership during 1977-82 grew faster than that of other plants by 16.2 percent [i.e., .459-.099(3) = .162]. However, this advantage of plants changing ownership diminishes as plant size increases. To be exact, when $\ln E=4.64$[17] (i.e., 459/.099 = 4.64) productivity of both types of plants grew at the same rate. Beyond this size -- about twice the average size in our sample, -- productivity of plants that did not change owners grew faster than that plants having ownership change.

The significant, positive coefficients for $OWNPLT_{AF}$ and negative, significant coefficients of $\ln E_{77}*OWNPLT_{AF}$ indicate that, except for larger plants, the productivity of acquiring firms' own plants grew faster than that of non-acquiring firms' surviving plants. This result contradicts the simple averages

reported in Table 3, showing that relative productivity of plants initially owned and kept through 1987 by acquiring firms decline by 6 percent from 1.18 in 1977 to 1.11 in 1987. This apparent contradiction is due to the fact that the unweighted averages in Table 3 do not include, among other things, controls for size and initial conditions.

Plant Closing Equation. The probit regression results reported in Table 7 show that the coefficients for $OC_{77\text{-}87}$ are negative and significant in all models. This indicates that plants experiencing ownership change are less likely to be closed than plants not changing owners. The coefficient for $OWNPLT_{AF77}$ is negative and significant with the linear models (Models I and II). However, this coefficient becomes significantly positive in the non-linear models (Models III and IV). The coefficients for the interaction terms, $OWNPLT_{AF}*RLP_{77}$ and $OWNPLT_{AF}*lnE_{77}$ are negative and significant. These estimates imply that small plants originally owned by acquirers are more likely to be closed than those owned by non-acquirers. However, for larger plants non-acquirers are more likely to close plants than acquirers. To better assess the impact plant type on the probability of plant closure, we used the parameter estimates of the probit models reported in Table 7 to estimate the probabilities of plant closure for plants that experienced ownership change, plants originally owned by acquirers, and plants owned by non-acquirers in 1977.

The results reported in Table 8 show that plants that were owned by non-acquirers were most likely to be closed and plants that had ownership change are most likely to survive. The unconditional probability of closure (Model I) for plants that were owned by non-acquirers is .6236, while that for plants having ownership change is .1708. The probability of closing for acquirers' own plants is .4550. When controlling for initial productivity, employment size, and allowing non-linearity, we also find similar results. The evidence suggests that plants changing owners had a much greater chance to survive than plants not changing owners. Acquirers' own plants are less likely to be closed than those originally owned by non-acquirers.

VII. DISCUSSION

Our empirical results can be summarized into the following principal findings. (1) Except for a subset of the largest plants (top 10 to 20 percentiles), the growth rate of relative labor productivity for plants experiencing ownership change during 1977-82 was higher than that of surviving non-acquiring firms. (2) Except for the same subset of the largest plants, the wage rate of workers in plants with ownership change increased faster than that of their counterparts in plants owned by non-acquiring firms. (3) Employment of surviving plants without changing owners grew about the same rate as that for plants undergoing ownership change in the 1977-82 period, but plants changing owners between 1983-87 show a substantial

increase in employment regardless of size. (4) Not only did plants experiencing ownership change achieve higher wage and productivity growth, but so did plants continuously owned by surviving acquirers over the period. (5) None of the above results holds when firms are used as the unit of analysis. (6) Finally, ownership change is associated with a lower likelihood of plant closing than for plants originally owned by acquiring firms and non-acquiring firms.

The first result is consistent with the finding of Lichtenberg and Siegel (1992a), and McGuckin and Nguyen (1994a) that plants improved their productivity after changing ownership. It is also consistent with Baldwin's result (1991) that plants acquired by a firm in the same industry and plants spun off from a continuing company experienced a significant increase in productivity. More important, this result is consistent with most merger theories, including the managerial-discipline theory and synergy theory. These theories predict that targets of takeovers should improve their performance in the post-merger period. In view of the finding of positive association between pre-merger productivity and ownership change (McGuckin and Nguyen, 1994a; and Scherer and Ravenscraft, 1987) together with the result in (1) we conclude that synergy is at work.

The finding that wages of workers in plants undergoing ownership change grew faster than those not experiencing ownership change is striking, and does not support the notion

that acquisitions and mergers cut wages. This result holds for all plants undergoing ownership change in both the 1977-82 and 1983-87 periods, even after controlling for the effects of plants' initial employment, size, wages, productivity, changes in technology, and (4-digit) industries. This result is inconsistent with Brown and Medoff's finding (1988) that wage changes associated with ownership change are relatively small. However, the Brown-Medoff evidence was based on firm-level data. In this regard, our results are not inconsistent with theirs.

While we find that ownership change had a significant, positive effect on plants' employment growth, this result is not robust and should be interpreted with caution. Recall that when we classified plants with ownership change into two groups -- one consisting of plants changing ownership between 1977 and 1982, the other consisting of plants changing ownership during the 1983-87 period -- we found that ownership changes during 1977-82 did not have a significant effect on employment growth. In contrast, ownership changes occurring during 1983-87 showed a significant positive effect on employment growth. It is possible that employment growth in these plants occurred before ownership change. More likely is the possibility that acquirers had not completely "digested" these newly purchased plants and that some of these plants eventually will be closed or resold as was true for plants acquired in the 1977-82 period. Nevertheless, overall we find no strong evidence supporting the hypothesis that

ownership change destroys jobs by either reducing employment in surviving plants or by increasing the probability of plants closing. This, together with the first two results provides strong evidence against the notion that mergers and acquisitions reduce employment.

Finally, when using firms as the unit of analysis, we find no significant effects of ownership change on productivity, wages, and employment.[18] This result is extremely important. It points to the fact that assessing the impact of ownership change (including mergers and acquisitions) on the structure and performance of firms requires a careful look at individual components -- establishments -- of the firms. Mueller (1993) correctly pointed out that

> *"Any **real** [emphasis is original] consequences of a merger must come about through changes in the development of one or both joining units that can be attributed to the merger in the following years".*

Our firm level results demonstrate that simply looking at the performance of firms before and after ownership change fails to capture the effects of ownership change and the different factors at work.

Before concluding, we note that our data do not cover auxiliary establishments. Lichtenberg and Seigel (1992b) find

that failure to account for auxiliary establishments leads to underestimating productivity gains associated with ownership change. However, this indicates that including auxiliary establishment data would strengthen, rather weaken, our finding that ownership change improved productivity.

Regarding wages and employment, if ownership change results in reducing wages and employment in auxiliary establishments as indicated by the Lichtenberg-Seigel study, then our estimates of employment and wage growth are likely to be biased upward. We note, however, that this bias is most likely to be serious in the case of large multi-unit firms. For smaller firms, the bias may be less important; and it does not exist in the case of single-unit firms.

VIII. CONCLUDING REMARKS

A wide range of recent empirical work with establishment-level data finds within-industry differences between establishments are the major source of variation in productivity, wages, and jobs. For example, Davis, Haltiwanger, and Schuh, (1994) report a greater range of variation in job changes between plants in the steel industry than the range of difference between the average establishment in the steel and textile industries. Similarly, Davis and Haltiwanger (1992) and Bernard and Jensen (1994) show that most of the variation in wages occurs within

industries. Moreover, Baily, Campbell, and Hulten, (1992) demonstrate that the within-industry variation in productivity growth is primarily associated with movements between establishments. In the Baily, Campbell, and Hulten study it is gains in market share by high productivity plants and the exit of low productivity plants that drive industry-level changes in productivity. Taken together, these studies convincingly demonstrate that between plant variation is important for productivity, wages, and job reallocations.

The evidence developed in this study shows that, at least for food industry establishments, ownership change is associated with increased productivity, wages, and employment growth. Acquiring firms are high productivity firms that acquire firms with above average productivity and improve them. This suggests that ownership change is an important part of the process of reallocating resources from lower to higher valued plants found in these earlier plant-level studies. The result that ownership change is associated with productivity growth appears robust across the U.S. manufacturing sector for the period studied, the late 1970s and 1980s.[19] Thus, ownership change fits well within a framework emphasizing productivity growth through reallocations of labor from lower to higher productivity firms. While the benefits associated with changing ownership -- movement of resources from lower to higher valued uses -- may be large, the costs also can be significant. The often expressed hostility

toward mergers -- by labor unions and the press -- reflects their view that the costs are high. Typically cited effects of ownership change are closed plants and shifts of production to areas with low labor costs. The combination of high costs and benefits makes the study of ownership change a prime area for applied research.

In closing, we note that we plan to continue this line of research on several fronts. Our immediate plan is twofold: to extend the dataset in time to account for more than one merger wave, and to include other industries. We also plan to extend the dataset to include data for auxiliary establishments such as central offices. Finally, rather than looking at total employment, further research should treat production workers and non-production workers separately. This would shed more light on the impact of ownership change on wages and shifts in the skill distribution of workers within the firm.

TABLE 1
ACQUIRING AND NON-ACQUIRING FOOD MANUFACTURING FIRMS, 1977-87[a]

	Average Employment Size		# of Firms		Wage Rate		Total Employment		1977 RLP[c]	
	1977	1987	1977	1987	1977	1987	1977	1987	1977	1987
ACQUIRING FIRMS 1977-82										
1. Single-Unit Firms										
* Surviving by 1987	113	79	25	25	20,228	18,911	2,821	1,980	.82	.65
* Sold by 1987	195	---	---	---	22,183	---	2,920	---	1.11	---
* Exit by 1987	172	---	---	---	20,747	---	8,955	---	.98	---
SUBTOTAL	158	79	25	25	20,839	18,911	14,696	1,980	.96	.65
2. Non-Manufacturing (one food plant)										
* Surviving by 1987	91	208	48	48	22,581	20,817	4,379	9,997	1.09	.98
* Sold by 1987	225	---	33	---	19,708	---	7,425	---	.82	---
* Exit by 1987	109	---	53	---	19,75	---	5,754	---	.93	---
SUBTOTAL	131	208	134	48	1	20,817	17,558	9,997	.96	.96
					20,754					
3. Non-Manufacturing Firms (more than one food plant)										
* Surviving by 1987	638	1,086	84	84		22,566	53,557	91,201	1.03	1.07
* Sold by 1987	393	---	40	---	22,605	---	15,739	---	1.05	---
* Exit by 1987	234	---	27	---	20,323	---	6,308	---	1.07	---
SUBTOTAL	501	1,086	15	84	21,202	22,566	75,604	91,201	1.04	1.07
					21,750					
4. Multi-Unit Manufacturing Firms										
* Surviving by 1987	3,649	5,011	268	268		23,360	977,878	1,343,0	1.14	1.08
* Sold by 1987	2,407	---	65	---	22,352	---	221,430	51	1.03	---
* Exit by 1987	157	---	22	---	22,202	---	3,463	---	1.07	---
SUBTOTAL	3,338	5,011	355	268	24,200	23,360	1,202,7	---	1.11	1.08
					22,439		34	1,343,0		
								51		
NON-ACQUIRING FIRMS 1977-82[b]										
1. Single-Unit Firms	25	32	5,162	5,162		16,222			.76	.69
* Surviving by 1987	60	--	436	---	19,849	---	129,05		.90	---
* Sold by 1987	13	---	9,469	---	20,266	---	0	163,864	.78	---
* Exit by 1987	18	32	15,06	5,162	19,438	16,222	26,160	---	.78	.69
SUBTOTAL			7		19,60		123,09	---		
					3		7	163,864		
							278,307			
2. Non-Manufacturing (one food plant)	90	121		475		19,50			.88	.82
* Surviving by 1987	126	144	475	80		7			.96	---
* Sold by 1987	48	---	80	---	19,908	21,851		57,686	.84	---
* Exit by 1987	70	125	630	555	21,431	---	42,750	11,527	.87	.82
SUBTOTAL			1,185		19,467	19,845	10,080	---		
					19,776		30,240	69,213		
							83,070			
3. Multi-Unit Manufacturing Firms[c]	1,570	1,451		667					1.00	1.02
* Surviving by 1987	981	---	667	---		22,203			.96	---
* Sold by 1987	124	---	169	---	21,298	---		967,793	.90	---
* Exit by 1987	1,083	1,451	321	667	21,843	---	1,047,2	---	.97	1.02
SUBTOTAL			1,157		19,73	22,203	55	---		
					5		165,789	967,793		
					20,940		39,804			
							1,252,84			
							8			

[a] Multi-unit firm productivity is based on the weighted average (labor weights) of plant productivity.

[b] Includes 120 firms that acquired properties in the 1983-87 period.

[c] Includes multi-unit firms with non-manufacturing operations.

TABLE 2
PRODUCTIVITY, EMPLOYMENT AND WAGES OF ACQUIRING AND NON-ACQUIRING MULTI-UNIT MANUFACTURING FIRMS AND COMPONENT PARTS: 1977 AND 1987
(Simple Means)

	Relative Productivity		Total Employment		Real Wage Rates	
	1977	1987	1977	1987	1977	1987
ACQUIRING FIRMS (1977-82)[a]						
Surviving to 1987	1.14	1.08	977,878	1,343,051	22,352	23,630
Sold by 1987	1.03	---	221,430	---	22,202	---
Exit by 1987	1.07	---	3,460	---	24,200	---
ALL FIRMS	1.12	1.08	1,202,768	1,343,051	22,439	23,630
Components of Surviving Acquiring Firms						
Plants Owned in 1977	1.18	1.11	647,486	662,300	22,554	23,793
Kept in 1987	1.11	---	139,643	---	22,645	---
Sold by 1987	1.04	---	190,749	---	21,628	---
Exit by 1987	1.12	1.11	977,878	662,300	21,806	23,793
ALL PLANTS						
Plants Acquired 1977-82	1.02	1.06	189,496	261,811	21,198	21,653
Kept in 1987	.95	---	75,234	---	21,265	---
Sold by 1987	.97	---	15,919	---	24,205	---
Exit by 1987	.98	1.06	280,649	261,811	21,629	21,653
ALL PLANTS						
	---	1.20	---	52,335	---	21,808
New Plants 1977-82						
	---	1.16	---	67,687	---	23,034
New Plants 1983-87						
	1.01	.98	322,328	357,404	21,719	21,876
Plants Acquired 1983-87						
NON-ACQUIRING FIRMS (1977-82)[a,b]	1.00	1.02	1,047,255	967,793	21,291	22,203
Surviving to 1987	.96	---	165,789	---	21,843	---
Sold by 1987	.90	---	39,804	---	19,735	---
Exit by 1987	.97	1.02	1,252,848	967,793	21,422	22,203
ALL FIRMS						
Components of Surviving Non-Acquiring Firms						
Plants Owned in 1977	1.04	.99	639,377	595,662	21,515	22,184
Kept in 1987	1.05	---	127,241	---	22,616	---
Sold by 1987	.95	---	235,637	---	20,198	---
Exit by 1987	1.01	.99	1,047,255	595,662	21,136	22,184
ALL PLANTS						
	---	1.21	---	65,626	---	20,935
New Plants 1978-82						
	---	1.15	---	100,145	---	22,305
New Plants 1983-87						
	.95	.97	183,752	206,360	22,157	22,376
Plants Acquired 1983-87						

[a] Firm productivity is based on the weighted average (labor weights) of plant productivity.

[b] Includes 120 firms that acquired plants in the 1983-87 period.

TABLE 3
FIRM LEVEL REGRESSIONS[A]
(t-ratios in parentheses)

	The Wage Equation		The Employment Equation		The Productivity Equation	
	Model I (1)	Model II (2)	Model I (3)	Model II (4)	Model I (5)	Model II (6)
Intercept	1.094* (12.6)	1.143* (13.8)	.536 (1.6)	.390 (1.1)	.519* (4.0)	.452* (3.8)
ACQUIRER	-.082* (1.2)	-.087 (1.4)	.459 (1.7)	.166 (1.7)	-.205* (1.4)	-.196 (1.3)
lnE_{77}	.046+ (2.1)	.012 (1.7)	-.262* (8.9)	-.258* (8.6)	-.024* (1.0)	-.022 (0.9)
$ln(Wage_{77})$	-.384* (14.5)	-.374* (15.5)	.234+ (2.3)	.241+ (2.1)	---	---
$lnRLP_{77}$	---	---	---	---	-.358* (4.8)	-.363* 4.8)
lnE_{77}*ACQUIRER	.010 (0.9)	.010 (0.9)	.067 (1.6)	.068 (1.6)	.030 (1.3)	.031 (1.3)
lnE_{77}*$lnRLP_{77}$	---	---	---	---	.006 (1.4)	.006 (0.4)
) TECH	---	.138* (2.5)	---	.047 (0.2)	-.317* (2.4)	---
FOOD	---	-.076* (3.8)	---	.115 (1.3)	-.069 (1.4)	---
.	---	.188* (12.5)	---	---	---	---
R^2	.212	.353	.166	.166	.154	.147
n	804	804	804	804	804	804

[A] The dependent variable of the wage, employment, and productivity equations in $ln(Wage_{77})$ - $ln(Wage_{77})$, lnE_{87} - lnE_{77}, and $lnRLP_{87}$ - $lnRLP_{77}$, respectively.

* denotes "significant" at the one percent level.

+ denotes "significant" at the five percent level.

TABLE 4
THE WAGE CHANGE EQUATION
(t-ratios are in parentheses)

Dependent Variable: ln (wage87) - ln (wage77)

Food Plant Data

Independent Variable	Model I (1)	Model II (2)	Model III (3)	Model IV (4)	Model V (5)	Model VI (6)
Intercept	.494* (14.8)	.757* (20.4)	.490* (14.8)	.754* (20.4)	.485* (19.6)	.732* (19.6)
OC	-.012 (1.2)	-.020+ (1.9)	.508* (13.0)	.387* (10.2)	---	---
OC7782	---	---	---	---	.470* (8.3)	.377* (7.0)
OC8387	---	---	---	---	.599* (11.3)	.465* (9.1)
$OWNPLT_{AF}$	---	---	---	---	.403* (9.8)	.278* (6.8)
ln E77	.125* (55.4)	.132* (54.5)	.134* (54.0)	.138* (55.2)	.140* (49.0)	.144* (50.9)
ln (Wage 77)	.374* (34.2)	-.471* (40.4)	-.373* (34.6)	-.468* (40.4)	-.379* (35.1)	-.465* (40.1)
) TECH	.085* (16.8)	.074* (15.3)	.046* (9.1)	.035* (7.1)	.048* (9.2)	.035* (7.2)
lnE_{77}*OC	---	---	-.113* (13.8)	-.089* (11.3)	---	---
lnE_{77}*OC7782	---	---	---	---	-.115* (9.6)	-.095* (8.3)
lnE_{77}*OC8387	---	---	---	---	-.127* (11.7)	-.104* (9.9)
lnE_{77}*$OWNPLT_{AF}$	---	---	---	---	-.083* (9.5)	-.063* (7.2)
>	.262* (47.3)	.272* (50.3)	.262* (47.9)	.273* (50.9)	.259* (4.73)	.271* (50.5)
4-Digit Industries	NO	YES	NO	YES	NO	YES
R^2	.450	.576	.462	.523	.469	'.526
n	8,955	8,955	8,955	8,955	8,955	8,955

* denotes "significant" at the one percent level.

+ denotes "significant" at the five percent level.

TABLE 5
THE EMPLOYMENT CHANGE EQUATION
(t-ratios are in parentheses)

Dependent Variable: ln (wage87) - ln (wage77)

Food Plant Data

Independent Variable	Model I (1)	Model II (2)	Model III (3)	Model IV (4)	Model V (5)	Model VI (6)
Intercept	-.147* (2.3)	-.480* (6.7)	-.140+ (2.2)	.493* (6.8)	-.057 (0.91)	-.412* (5.6)
OC	.114* (6.0)	.119* (6.3)	.033 (0.4)	.239* (3.3)	-----	-----
OC7782	-----	-----	-----	-----	-.150 (1.4)	.033 (0.3)
OC8387	-----	-----	-----	-----	.067 (0.7)	.357* (3.6)
$OWNPLT_{AF}$	-----	-----	-----	-----	-.434* (5.6)	-.004 (0.1)
lnE_{77}	-.155* (31.5)	-.183* (36.1)	-.156* (30.1)	-.181* (33.9)	-.181* (29.5)	-.200* (32.5)
ln ($Wage_{77}$)	.209* (18.3)	.387* (17.3)	.209* (10.3)	.389* (17.3)	.203* (10.0)	.374* (16.7)
) TECH	.351* (35.7)	.354* (36.9)	.351* (35.9)	.353* (36.8)	.351* (36.0)	.355* (37.09)
lnE_{77}*OC	-----	-----	.018 (1.1)	-.026 (1.7)	-----	-----
lnE_{77}*OC7782	-----	-----	-----	-----	.069* (3.0)	.029 (1.3)
lnE_{77}*OC8387	-----	-----	-----	-----	.021 (1.0)	-.038+ (1.9)
lnE_{77}*$OWNPLT_{AF}$	-----	-----	-----	-----	.116* (70)	.033+ (2.0)
4-Digit Industry	NO	YES	NO	YES	NO	YES
R^2	.226	.286	.228	.288	.277	.293
n	8,955	8,955	8,955	8,955	8,955	8,955

* denotes "significant" at the one percent level.

+ denotes "significant" at the five percent level.

TABLE 6
THE PRODUCTIVITY CHANGE EQUATION
(t-ratios are in parentheses)

Dependent Variable: $\ln(RLP_{87}) - \ln(RLP_{77})$

Food Plant Data

Independent Variable	Model I (1)	Model II (2)	Model III (3)	Model IV (4)	Model V (5)	Model VI (6)
Intercept	-.239* (13.0)	-.089*	-.251* (10.2)	-.084+ (2.3)	-.268* (10.7)	-.088* (2.5)
OC	-.127* (6.0)	-.123* (6.0)	.194* (2.5)	.104 (1.4)	-----	-----
OC7782	---	---	-----	-----	.535* (4.8)	.459* (4.3)
OC8387	---	---	-----	-----	-.084 (0.8)	-.167 (1.5)
$OWNPLT_{AF}$	---	---	-----	-----	.617* (7.5)	.580* (7.0)
$lnRLP_{77}$	-.220* (38.7)	-.205* (35.6)	-.228* (12.6)	-.227* (12.9)	-.247* (13.4)	-2.43* (13.6)
lnE_{77}	.086* (18.5)	.101* (21.2)	.091* (13.8)	.100* (15.2)	.096* (13.5)	.099* (14.1)
)TECH	.142* (14.4)	.169* (17.6)	.141* (14.3)	.168* (17.5)	.141* (14.3)	.167* (17.5)
lnE_{77}*OC	---	---	-.069* (4.2)	-.049* (3.1)	-----	-----
lnE_{77}*OC7782	---	---	-----	-----	-.118* (5.0)	-.099* (4.3)
lnE_{77}*OC8387	---	---	-----	-----	-.041 (1.8)	-.020 (.9)
lnE_{77}*$OWNPLT_{AF}$	---	---	-----	-----	-.130* (7.5)	-.115* (6.6)
lnE_{77}*$\ln(RLP_{77})$	---	---	.001 (.3)	.005 (1.2)	.008 (1.6)	.011* (2.5)
4-Digit Industry	NO	YES	NO	YES	NO	YES
R^2	.191	.267	.193	.268	.203	.277
n	8,955	8,955	8,955	8,955	8,955	8,955

* denotes "significant" at the one percent level.

+ denotes "significant" at the five percent level.

TABLE 7
PROBIT REGRESSIONS OF PLANT CLOSURE
(standard error in parentheses)

Dependent Variable: Plant Closure[a]

Independent Variable	Model I (1)	Model II (2)	Model III (3)	Model IV (4)
Intercept	.315*	.887*	.809*	.931*
	(.009)	(.017)	(.025)	(.032)
OC_{77-87}	-1.266*	-.926	1.520	-1.372*
	(.025)	(.026)	(.089)	(.090)
$OWNPLT_{AF}$	-.428*	-.076*	.671*	.861*
	(.024)	(.026)	(.095)	(1.00)
lnE_{77}	-----	-.203*	-.186*	-.263*
		(.005)	(.008)	(.016)
$lnRLP_{77}$	-----	-.053*	-.045+	-.029*
		(.009)	(.022)	(.028)
lnE^2_{77}	-----	-----	-----	.012*
				(.002)
$lnRLP^2_{77}$	-----	-----	-----	.006*
				(.001)
OC_{77-87}*lnE_{77}	-----	-----	.139*	.113
			(.018)	(.018)
OC_{77-87}*$lnRLP_{77}$	-----	-----	-.012	-.050+
			(.027)	(.027)
$OWNPLT_{AF}$*lnE_{77}	-----	-----	-.128*	-.166*
			(.019)	(.020)
$OWNPLT_{AF}$*$lnRLP_{77}$	-----	-----	-.147*	-.169*
			(.023)	(.024)
$lnTE_{77}$*$lnRLP_{77}$	-----	-----	-.022*	-.013
			(.007)	(.008)
n	28,236	28,236	28,236	28,236

[a] Plant closure = 1 if the plant was closed by 1987; else plant closure = 0.

* Denotes "significant" at the one percent level.

+ Denotes "significant" at the five percent level.

TABLE 8
PROBABILITIES OF PLANT CLOSINGS

	Model I	Model II	Model III	Model IV
Plants had Ownership Change	.1708	.1525	.1329	.1519
Acquirer's Own Plants	.4550	.4323	.3838	.4120
Non-Acquirer's Own Plants	.6236	.6322	.6011	.6326

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APPENDIX A

The Longitudinal Research Database (LRD) is a plant-level database. In the LRD, the firm identification variable -- the "ID" -- incorporates information about a plant's ownership. Two types of plants exist within the LRD: (1) "single-unit" (SU) firms having only one plant; (2) "multi- unit" (MU) firms having more than one plant -- although they may have only one plant in the LRD, which is restricted to operating manufacturing plants. The ID variable incorporates this affiliation dichotomy. In any year, a plant is affiliated with either a SU or MU firm. The ID of a SU firm (termed a "SU plant") has up to nine digits ranging from 1 to 999999999. A plant affiliated with a MU firm (termed an "MU plant") has ten digits, ranging from 1000000000 to 9999999999. The first six digits of a ten-digit MU plant ID, which is termed the "alpha number," is a firm identifier -- all plants owned by the same firm (in a particular year) have the same alpha number. The last four digits of the ten-digit MU plant ID are a plant identifier. Over time, the ID numbers of particular plants can change.

An ID change can indicate ownership change, but it can also indicate other things as well. The following describes the process of identifying ownership changes and separating them from other types of ID changes. This process has been incorporated into a computer program that identifies and classifies ownership changes in the LRD.

To identify ownership changes in the LRD requires three steps: (i) identify plants that change firm ID between two census years, (ii) within this set of plants, use certain codes in the LRD, called coverage codes, to identify directly a subset of plants that change ownership, and (iii) from the remaining plants, identify further ownership changes indirectly.

A change in ID does not necessarily mean ownership change. It can mean any of the following:

(1) The establishment was sold to another firm -- a true ownership change.

(2) A MU firm closed or sold all of its plants but one and became a SU firm. In this case, the ten-digit MU plant ID of the one plant that the firm kept becomes a less-than-ten-digit SU plant ID, and the other plant IDs also change -- either to other MU firm IDs or to other SU firm IDs.

(3) A SU firm became a MU firm by opening new plants or acquiring existing plants. The ID of the original plant is changed to a MU ID, and all of the plants owned by the firm are assigned the same alpha number.

(4) A MU or SU firm undergoes a legal reorganization that spurs a firm ID change without a change in actual ownership.

(5) An establishment previously classified as non-manufacturing is reclassified as manufacturing, and thus appears in the LRD for the first time. This is not a true "birth."

(6) Errors -- erroneous ID changes.

To identify true ownership changes, we need to use other information available in the LRD in addition to the ID variable. The main additional information is in the census coverage codes (called "CC codes") assigned to establishments in the Census or Annual Survey of Manufactures (ASM). The CC codes are two-digit numbers having values from 00 to 96, each indicating the status of the establishment. For example, a CC code of 00 indicates that the establishment has no change in operator or operations, while a CC code of 14 indicates that the establishment was acquired by another company.[20]

Ideally, all new firm IDs and CC codes would be recorded during the years that establishments change status (including ownership), so that it would be easy to identify mergers. In practice, this does not always happen. Except for large ASM establishments, neither changes in ID nor proper CC codes are always recorded during the years of status change. In many cases, particularly, for small establishments, a change in firm ID may appear one or more years before the corresponding CC code change occurs to explain the reason for the ID change. Also, for a large number of SU non-ASM establishments, proper CC codes were not assigned at all.

Thus, CC codes allows us to identify only a portion of the establishments that have ID changes due to ownership changes. We identified 16,877 establishments that changed firm ID between 1977 and 1982. The CC codes gave reasons for ID change for 65

percent (10,961) of these establishments -- 43 percent (7,257) were acquired and 22 percent (3713) changed ID for other known reasons, such as reclassification, combined report, firm reorganization, etc. The remaining 35 percent of establishments (5,916) were not assigned a CC code.

To find ownership changes among the group of plants with unexplained ID changes, we brought together initial and ending firm IDs for all plants that were owned by the firms in question. For example, suppose the LRD shows that plant A belonged to firm X in 1977 and to firm Y in 1982, but the 1982 CC code for plant A does not show this as an ownership change. But suppose we know that firm Y also acquired at least one other plant of firm X between 1977 and 1982 (Firm Y may also have sold or closed plants as well) In this case, it seems likely that firm Y bought plant A as well, and we code plant A accordingly. By making such assumptions, we increase the number of plants identified as acquired by 4,400 to 11,657, which account for 69 percent of total number of plants that had ID change.

During the period 1977-82, there were 494,623 firms operating in U.S. manufacturing, including 461,052 SU establishments and 33,571 MU establishments. Of the MU establishments, we identify 12,029 firms that entered manufacturing after 1977, 11,270 firms that exited by 1987, and 10,272 continuously operating firms. Among these firms, we identify 3,220 firms that acquired at least one establishment

during 1977-82. Of the acquiring firms, 1,622 continuously operated from 1977 to 1987, 1,167 entered manufacturing after 1977 and 431 exited manufacturing by 1987. Of the 461,052 SU firms, we identify 105,385 firms that continuously operated from 1977 to 1987, 182,503 entered manufacturing after 1977 and 173,163 exited manufacturing by 1987.

While the number of SU firms is large, they accounted for only 25 percent of total manufacturing employment in 1977 and 29 percent in 1987.

ENDNOTES

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1 Data problems also plague industrial organization specialists and are a major reason why there has been so little agreement on the effects of ownership change on firm performance.

2 Lichtenberg (1992) uses LRD data for most of his analysis.

3 For example, in the case of a public firm, ownership is constantly changing as shareholders buy and sell shares, but most such changes bear little relationship to the day to day operations of the firm.

4 Most industrial organization studies have not found gains associated with ownership change (e.g., Ravenscraft and Scherer, 1987). Results from Finance that show positive abnormal returns to shareholders of merging firms are consistent with gains to ownership changes.

5 Finding productivity gains positively related to ownership change does not fit well with any of the managerial excesses or empire-building arguments.

6 The effects on other moments of the wage distribution are unclear.

7 A more complete description of the LRD is given in McGuckin and Pascoe (1988).

8 Our preliminary work based on the entire U.S. manufacturing sector shows results that are similar to those reported here.

9 McGuckin and Nguyen (1994a) estimated that Both RLP and TFP using data for 3,800 continuous plants in the food industry. They

then used these two productivity estimates in their regression analysis of ownership change and found that the two measures yield very similar results. They note, however, that the results based on data for continuous plants are subject to serious simple selection bias.

10 Industry is defined at the 4-digit level throughout the paper.

11 Preliminary analysis suggests that a similar statement is true for all manufacturing.

12 We note that if these non-acquiring firms had relied entirely on internal growth and had not added 183,752 workers through acquisitions during 1983-87 (see Table 2), their 1987 employment could have been 25 percent below the 1977 level.

13 For all manufacturing, the non-acquirers paid slightly higher wages, but the differences are small.

14 In our preliminary work, we estimated various competing models for each equation. Here, we report only the results of two models for each equation because other models yield very similar results.

15 Inclusion of non-food manufacturing plants owned by food manufacturing firms does not alter the results.

16 The exact size at which performance of non-acquirers exceeds acquirers is sensitive to the sample of plants and model specification. Nonetheless, the size cutoff is always well above the third quantile of the employment size distribution and usually falls in the top ten to twenty percentiles.

17 Eighty percentile value of the sample.

18 McGuckin and Nguyen (1994b) used firm-level data to estimate

productivity growth equations in which acquiring firms are classified into two groups: full mergers and divestitures. They obtained similar results to both groups.

19 Our preliminary results based on data for the entire manufacturing sector appear to be consistent with those based on data for the food industry.

20 For a complete list of CC codes, see the LRD documentation (current version: Center for Economic Studies, 1992).