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FIRM PERFORMANCE FOLLOWING LAYOFF ANNOUNCEMENTS--

A DESCRIPTIVE ANALYSIS

by

SUNNIE CHU

A DISSERTATION

Presented to the Department of Accounting
and the Graduate School of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

June 1996

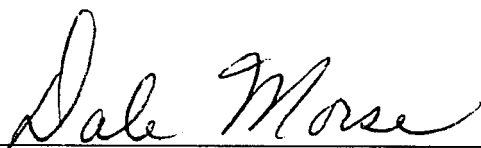
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“Firm Performance Following Layoff Announcements--A Descriptive Analysis,” a dissertation prepared by Sunnie Chu in partial fulfillment of the requirements for the Doctor of Philosophy degree in the Department of Accounting. This dissertation has been approved and accepted by:



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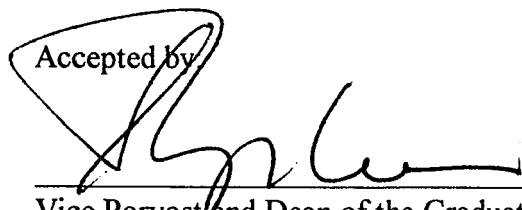


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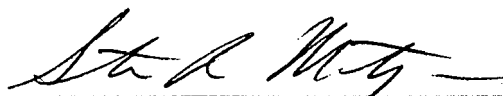
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This study undertakes a descriptive analysis of the performance of firms that announce layoffs. Because layoffs can be driven by different economic reasons, I examine whether performance is affected by the reason for the layoff. Accordingly, I classify layoffs as either a means of reducing the scale of the firm's operations or a means of improving efficiency, and partition sample firms based on the reason for the layoff. I examine the change in performance for the entire sample as well as for each subsample.

For the entire sample, on average, firms announcing layoffs have lower levels of profitability after the layoffs than prior to the layoff announcement year. However, the decline in profitability is not statistically significant relative to control firms in the same industry.

When sample firms are stratified according to the reasons stated in layoff announcements, I find that the profitability measures for sample firms citing reduction in operations as the reason for the layoff are lower in the subsequent period than their previous period, while the profitability measures for the subsample of firms citing improved efficiency as the reason for the layoffs generally do not differ from those in their previous period. On the other hand, when the change in performance is measured relative to control firms, the subsample of firms citing reduction in operations experiences declines in return on assets, return on equity, and operating income to total assets, but an increase in output per employee relative to control firms. The subsample of firms citing improved efficiency experiences an increase in profit margin on sales, return on assets, pretax income to sales and pretax income to total assets relative to control firms.

I also examine stock price reactions to layoff announcements. For the entire sample, stock prices react negatively in the two-day interval, day -1 to day 0, but positively in the subsequent ninety days. Although this result holds for subsample citing reduction in operations, for the subsample of firms that cite improved efficiency as the reason for the layoff, a significant stock price reaction cannot be detected over either interval.

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DEDICATION

This dissertation is dedicated to my father, my mother, and my son, Allard, for their love and support.

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CHAPTER I

INTRODUCTION

During the past few years, there has been a substantial increase in layoff activity in the U.S. The May 9, 1994 issue of Business Week, announced that staff reductions doubled from 300,000 in 1990 to over 600,000 in 1993.¹ Although several studies have investigated the financial effects of layoffs, the empirical evidence is mixed. This study attempts to resolve the conflicting results by segregating the sample based on the underlying economic forces that prompted the layoffs and investigating whether or not the subsequent financial performance of firms whose layoffs are driven by projected declining sales differs from the performance of firms whose layoffs are motivated by projected improvements in operating efficiency. By examining operating and stock price performance around layoff announcements, this paper provides descriptive evidence on the financial effects of layoffs.

Reports in the popular press suggest that layoffs improve profitability and productivity. In their January 24, 1994 issue, Fortune reports that among the Fortune 500, ... "What's sour medicine for the rank and file seems to be viewed as a miracle cure

¹ Many layoff announcements are made in compliance with the Worker Adjustment Retraining and Notification Act, which has been in effect since February 4, 1989 and applies to employers with 100 or more full-time employees or with 100 employees, including part-time employees, who together work at least 4,000 hours per week.

on Wall Street.” They cite as an example, Xerox, which saw a 7% increase in stock prices on December 8, 1993 when the CEO said he would cut the staff by 10%.^{2,3} A recent survey by the American Management Association, reported in the Wall Street Journal, found an improvement in profitability and productivity for some companies subsequent to layoffs.⁴ About 58% of these downsizing companies said that their profits had increased, and 44.3% saw improved productivity.⁵ The survey also found that 26% of the companies polled anticipated more staff reductions by June 1995.

Despite the frequency of major layoff announcements by large firms and the improvement reported by top management, research on work force reductions reveals an inconsistency in the impact of layoffs on a firm's profitability and stock prices. Two recent studies on layoff announcements [Worrell, Davidson, and Sharma (1991) and De Meuse, Vanderheiden, and Bergmann (1994)], do not find any improvement in organizational effectiveness or subsequent financial performance. Yet, Lev and Thiagarajan (1993), and Dial and Murphy (1995) report a favorable stock price reaction as a result of downsizing activities. Abarbanell and Bushee (1994 working paper), find that financial performance improves subsequent to downsizing activities. Also, two concurrent studies [Elayan, Maris, Scott and Swales (1995 working paper), and Iqbal and Akhigbe (1995 working

² "Wall Street Loves Layoffs", Fortune, January 24, 1994, p.12.

³ According to the Denver Post, March 20, 1996, AT&T announced its layoffs of 40,000 employees on January 3, 1996 and its stock price closed \$2.63 a share. Also, stock price of Apple Computer went up 63 cents on January 11, 1996 when rumors of laying off 1,000 employees were spreaded.

⁴ "Don't Stop Cutting Staff, Study Suggests", Wall Street Journal, September 27, 1994, Section B1.

⁵ The latest American Management Association's survey on companies that downsized between 1989 and 1994 reported in the Wall Street Journal, July 5, 1995, finds 55.6% of the companies claimed profit rose, and 34.4% claimed improved productivity.

paper)] find an improvement in subsequent performance.

The conflicting results could be due to a failure to adequately control for the economic forces leading to the layoff decision. A reduction in the labor force is indicative of a decline in the demand for labor, which can result from either an anticipated reduction in total output, or from technological changes that allow firms to produce the same output with less labor. This study refers to the former reason as “reduction in operations” and the latter as “improved efficiency”. Although these two reasons for a reduced demand for labor are not mutually exclusive, the above distinction is consistent with the literature on organizational change [Mohrman and Mohrman (1989), Lawrence (1989) and Loseby (1992)], and a June 1989 survey by the American Management Association. The purpose of this study is to investigate whether the change in financial performance is related to the economic forces that underlie the layoff decision.

This study extends prior research by focusing on the reasons for the layoff announcements and by using a larger sample.⁶ I address the conflicting results shown in previous studies by distinguishing layoffs driven by declining sales from layoffs driven by improved efficiency. By using the Lexus/Nexus database, I was able to identify 484 firms who made a total of 1,089 layoff announcements.⁷ This larger sample allows me to stratify the sample according to the underlying economic motivation and to provide detailed descriptions of firms that announce layoffs.

⁶ A concurrent study by Iqbal and Akhigbe (1995 working paper) examines financial performance according to reasons stated in layoff announcements.

⁷ Worrell, Davidson and Sharma (1991) study 194 layoff announcements on the Wall Street Journal from 1979 to 1987. De Meuse, Vanderheiden and Bergmann (1994) study 17 Fortune 100 firms with layoff announcements in 1989 in Workplace Trends.

This study provides descriptive evidence regarding the impact of layoffs on firm performance that should be of interest to employees, managers and investors. Managers and investors are interested in the effect of a layoff decision on the financial performance of the firm. If managers and investors know what to expect in terms of the improvement of future earnings, they will be in a better position to decide whether or not that improvement justifies subjecting employees to the inevitable adverse effects of the layoff decision. In other words, this study provides some information about the costs and benefits of a layoff decision.

The evidence for the entire sample supports the claim that firms announcing layoffs are associated with deterioration in profitability compared to their prior period. However, I find that the declining profitability is not statistically significant relative to control firms in the same industry. Specifically, the changes in performance, calculated by subtracting the prior performance from the subsequent performance, are significantly negative in profitability measures and positive in productivity measures for sample firms before adjusting the performance of control firms, but they are generally insignificant after this adjustment is made.

Because layoffs can have different economic motivations, I examine changes in performance for groups formed according to reasons for the layoffs. I find that changes in performance differ between groups partitioned on reasons for the layoffs. Further, I find some evidence supporting the contention that the change in performance differs between subsamples after adjusting for the performance of control firms. Firms announcing layoffs citing a reduction in operations are associated with a decline in profitability. This decline

in profitability for firms in this subsample is more severe than their control firms in certain profitability measures. For firms announcing layoffs citing improved efficiency, layoffs are not associated with a decline in profitability. On the contrary, some of the profitability measures of these sample firms improve in the subsequent period compared to the previous period after adjusting the change in profitability of control firms.

In general, the findings suggest that examining changes in performance of firms announcing layoffs without adjusting the performance of control firms can be misleading. I also find evidence that the change in performance differs depending upon the stated reason for the layoff. As a result, pooling layoffs of different economic reasons can prevent finding an association of layoffs with an improvement in financial performance.

This paper is organized as follows: Chapter II reviews literature relevant to this paper, Chapter III develops hypotheses for this study, Chapter IV describes the sample and the comparison firms, Chapter V analyzes the data, and Chapter VI is the conclusion.

CHAPTER II

LITERATURE REVIEW

According to an American Management Association's survey of firm management, the two most common reasons for layoff announcements are a) to improve efficiency and b) to reduce operations due to an anticipated decline in sales. Layoffs are also associated with mergers, acquisitions, takeovers, LBOs and management buyouts in order to eliminate duplicate functions created in the process. Since mergers and acquisitions create duplicity in operations and corporate control activities are arguably aimed at reducing prior inefficiency, workforce reductions would be expected following those activities.⁸ This study limits itself to layoff activities unrelated to corporate control activities. Empirical studies on workforce reductions are discussed in this section.⁹

Previous Studies on Layoff Announcements

Lin and Rozeff (1993) examine the relation of stock returns to cost-cutting decisions. They argue that managerial choices are dependent on the firm's financial

⁸ For changes in employment following mergers, tender offers and management buyouts, see Healy, Palepu and Ruback (1992), Bhagat, Shleifer and Vishny (1990), and Kaplan (1989).

⁹ The literature on organizational decline examines strategies for recovery and turnaround, downsizing and retrenchment. Generally, studies on recovery and turnaround strategies, such as Hofer (1980), and Hambrick and Schecter (1983), focus on the selection of a successful strategy for the particular situation. In contrast, studies on downsizing and retrenchment, such as Behn (1983), and Perry (1986), are concerned about the role of management in deciding the area of cuts, maintaining the morale of remaining employees and encouraging innovation.

situation. In their study, they propose three competing hypotheses to explain the relation between prior stock price performance and cost-cutting actions.¹⁰ The three hypotheses are: the pure efficiency hypothesis, the decreased demand hypothesis and the implied changes in net operating cash flow.¹¹ According to the pure efficiency hypothesis, cost-cutting actions represent the firm's response to changing cost factors as the firm seeks a new minimum cost. The decreased demand hypothesis postulates that a reduction in unit sales leads to operations that deviate from minimum cost and so cost-cutting actions become economical. They find that some of the cost-cutting measures, including layoffs, occur after significant stock price declines and stock prices react negatively on the two-day announcements period, day -1 to day 0. They conclude that their findings are consistent with the decreased demand hypothesis. This study groups firms with different financial situations into different categories and examines the stock price reactions and the subsequent performance of each category separately.

Other empirical studies on work force reduction do not provide consistent evidence regarding the impact of layoffs on firm profitability and stock price. De Meuse, Vanderheiden, and Bergmann (1994) examine layoffs announced in 1989 and find that financial performance declines in the subsequent two-year period. Worrell, Davidson, and

¹⁰ Cost-cutting decisions include: temporary layoffs, permanent layoffs--hourly labor, permanent layoffs--salaried labor, temporary operation closings, permanent operation closings, permanent operation closings with production reassigned, wage freezes and cuts initiated by the firm, concessions on salaries by labor, miscellaneous cost-cutting.

¹¹ The implied changes in net operating cash flows hypothesis argues that stock price reactions to announcements are based on whether or not an announcement contains information on an increase or a reduction in sources or uses of funds. Hence, given that layoffs supposedly reduce operating costs, which is a use of funds, the implied changes in net operating cash flows hypothesis predicts that layoff announcements are associated with negative stock market reactions. The economic motivation behind this hypothesis is not clear.

Sharma (1991) study layoffs announced from 1979 to 1987 and find that stock prices react negatively to layoff announcements. On the other hand, Dial and Murphy (1995) find an association between layoff announcements and an increase in shareholder wealth. Two concurrent studies [Elayan, Maris, Scott and Swales (working paper), and Iqbal and Akhigbe (working paper)] examine stock price reactions and accounting performance and both claim that accounting performance improves subsequent to layoff activities. In addition to layoff studies, Lev and Thiagarajan (1993), and Abarbanell and Bushee (working paper) provide indirect evidence on improved effectiveness of workforce reduction.

This chapter discusses studies that examine the accounting performance of firms announcing layoffs and stock price reactions to these layoff announcements, then goes on to a discussion of studies investigating the association between the change in the workforce and the accounting performance or the stock price reaction. Appendix A lists the sample included in studies examining stock price reactions and financial performance around layoff announcements.

De Meuse, Vanderheiden, and Bergmann (1994) present evidence that financial performance declines after a layoff announcement. They find that financial performance, as measured by profit margin and ROE, decreases significantly in the subsequent two years. The study looks at the prior and subsequent performance of lay-off firms, but suffers from severe limitations. They selected their sample firms from the top 100 firms in Fortune's 1989 listing and consequently have a very small sample size, which includes only 17 firms announcing layoffs in 1989. Their control sample consists of 35 firms that

supposedly did not announce layoffs during the years 1989 to 1991. Using my sources, I find that 19 of their control firms announced layoffs during that period. Also, their study fails to provide a control for specific industry effects. Growth opportunities, which affect the performance and strategies of firms, vary among industries. Financial ratios also may differ across industries. Gupta and Huefner (1972) find that cross-sectional differences in financial ratios are mainly related to their industries. In addition, some industries are more likely to be affected by an economic downturn than others. Therefore, the absence of a perceived improvement in the financial performance of sample firms can be attributed to failing to provide a control for specific industry effect. Furthermore, as noted above, companies reduce employment levels for different reasons. A company may reduce labor costs in order to put expenses in line with future revenues, or to remove waste or inefficiency. If the effect on financial performance differs for firms announcing layoffs for different reasons, then pooling all sample firms together would lead to misleading conclusions.

Worrell, Davidson, and Sharma (1991) investigate the stock price reactions to layoffs announced from 1979 to 1987. They stratify the announcements into two subsamples: “restructuring and consolidation”, and “financial distress”.¹² They find that stock prices react negatively to the announcements for the full sample and to the “financial distress subsample” for the three intervals: day -1, day -90 to day +90, and day -90 to day -5.¹³ However, they do not find significant results with the “restructuring and

¹² The sample includes 194 layoff announcements from 1979 to 1987 with 87 announcements resulting from financial distress and 30 announcements resulting from restructuring and consolidation.

¹³ Except for the interval day -90 to day +90, which is positive and statistically significant, mean

consolidation subsample". They conclude that layoff announcements generally convey unfavorable information about the firms unless the stated reason is restructuring or consolidation.

Dial and Murphy (1995) provide evidence contrary to the findings of Worrell, Davidson, and Sharma. They study shareholder value created at General Dynamics for the period 1991-1993 subsequent to appointing a new management team. Although they associate the increase in shareholder wealth with the implementation of an incentive bonus plan based on stock price performance, their breakdown of the sources of the value gained during the three-year period indicates that the three-day industry-adjusted returns surrounding downsizing announcements accounts for \$266 million or 6% of the value gain.¹⁴

Two concurrent studies [Elayan, Maris, Scott and Swales (1995 working paper) and Iqbal and Akhigbe (1995 working paper)] examine both the accounting and stock price performance of firms announcing layoffs. Both studies find improvements in financial performance after the layoffs. They provide evidence consistent with Worrell, Davidson and Sharma but inconsistent with De Meuse Vanderheiden and Bergmann. Similar to De Meuse, Vanderheiden and Bergmann, Elayan et. al. examine the performance of the full sample, while Iqbal and Akhigbe examine performance on stratified subsamples. Although neither study controls for size, both studies control for industry effects by comparing earnings performance for firms announcing layoffs to mean

cumulative prediction errors are not significant.

¹⁴ Downsizing announcements include announcements related to layoffs and sales of divisions.

or median industry values, and both studies find that the financial performance of the layoff sample increases relative to the industry average.

Elayan, Maris, Scott and Swales (1995 working paper) extend Worrell, Davidson and Sharma's study by covering a longer time period and examining accounting performance. They investigate the earnings effect and stock price reactions of 646 layoffs announced from 1979 to 1991. They compare the percentage change of three performance measures in year -2 to year -1 to the percentage change in year +1 to year +2, with, and without adjusting for industry averages, find a higher percentage change in the period year +1 to year +2 for two measures: ROE and net income per employee. One explanation for their result is that their performance measures, ROE and net income per employee, are affected by layoff-related charges in the base year, which can lead to a mechanical improvement in the subsequent period. Also, the number of firms included in the subsequent period is almost one-fourth less than that in the prior period, which can cause bias toward finding improvement in subsequent performance if firms performing poorly are dropped out in the subsequent period.

Iqbal and Akhigbe (1995 working paper) examine the financial performance of a sample of 48 firms announcing employee layoffs of at least 5% of workforce during 1985 to 1990.¹⁵ They find that operating cash flow for each of the three subsequent years is larger relative to the announcement year.^{16,17} However, the return on sales, return on

¹⁵ Of the 48 firms, only 37 firms have stock return data on CRSP.

¹⁶ For 13 firms with layoffs in multiple years, the layoff period starts from the year of the first layoff through the year of the last layoff, and the median value in the layoff period represents performance for the announcement year. Also, the year of the first layoff announcement is used to determine the prior period while the year of the last layoff announcement is used to determine the subsequent period.

book value of assets and return on market value of assets do not reveal any improvement over the same period. When firms are classified into passive-response and improve-efficiency subsamples according to the reasons stated in layoff announcements, they find some evidence that the passive response subsample is associated with a reduction in operating cash flow in the subsequent period.^{18,19}

Other Layoff Related Studies

Lev and Thiagarajan (1993) and Abarbanell and Bushee (1994 working paper) provide some contradictory empirical evidence on the effects of labor force reduction on the improvement of performance. Lev and Thiagarajan (1993) examine the incremental explanatory power of 12 financial variables (fundamentals) on stock returns. The labor force variable is calculated as the annual percentage change in sales-per-employee, which captures changes in the efficiency of employees and changes in the number of employees.

Lev and Thiagarajan ran two annual cross-sectional regressions each year for the period 1974-1988. They first regress 12 months cumulative excess stock returns on the

¹⁷ They do not find statistically significant improvement in earnings performance when comparing the median values of the three-year period prior to the announcement years with the median 4-digit SIC industry-adjusted earnings performance on the announcement year, each the three subsequent years and the median values of the three subsequent years.

¹⁸ Firms are classified as passive-response when citing financial difficulties without any indications of improving performance. Firms are classified as improve-efficiency when layoffs are associated with favorable news (such as a boost in earnings) about the firm's future performance. Of the 48 firms, 19 firms are classified as passive-response and 20 firms are classified as improve-efficiency for earnings performance. Eighteen passive-response firms and 11 improve-efficiency firms are included when studying stock price reactions.

¹⁹ Instead of comparing performance of each of the three subsequent years with that of the layoff period, the comparison is made between the median performance of three subsequent years with the median performance of three years prior to the layoff period or with the median performance on the layoff period.

annual change in earnings per share for each sample firm. The second regression includes the financial variables to investigate the incremental explanatory power of those financial variables. By examining the coefficient estimates on the labor force variable, they find some evidence that labor force reductions are associated with improvements in stock price performance.

Abarbanell and Bushee (working paper) extend Lev and Thiagarajan's study by examining the association of nine financial variables with the earnings change of one year and five years ahead, and revisions in analysts' forecasts, in addition to cumulative excess returns. They find that the coefficients of the labor force variable for the annual regressions are negative, and the across-years mean is negative and statistically significant. Their findings suggest that a decrease in the number of employees is positively related to changes in earnings one and five years ahead. Contrary to Lev and Thiagarajan's findings, Abarbanell and Bushee do not find a negative association between the mean coefficients of the labor force variable and 13-month cumulative excess returns.

In summary, the above layoff studies do not provide consistent empirical evidence on changes in financial performance following layoffs. One possible explanation for the inconclusive empirical results could be that firms reduce employment for different reasons and so exhibit different characteristics. Therefore, failing to account for causal differences among layoff firms can lead to inconsistent findings. Another possible explanation could be the failure to control for size or industry. The next chapter explores different reasons for layoff activities and develops hypotheses.

CHAPTER III

DEVELOPMENT OF HYPOTHESES

This chapter discusses the association between layoffs and changes in financial performance, and the expected stock price reactions to the layoff announcements. In general, a workforce reduction can be caused by either a reduction in operations or improved efficiency. Since changes in performance can be different for firms anticipating a decline in sales as compared to firms aiming for an improvement in efficiency, the following discussion develops some generalizations on the association between reasons for the layoffs and changes in firm performance.

Entire Sample

Before proceeding with a discussion on the association between the reasons for layoffs and changes in financial performance, this study examines firms' performances ignoring the reasons for layoffs. This allows a comparison of findings with previous studies and an examination of performance for firms announcing layoffs as a whole as opposed to firms in separate groups.

Accounting Performance

De Meuse, Vanderheiden and Bergmann present evidence of a deterioration in

financial performance subsequent to layoff announcements. They compare the mean values of five performance measures for firms announcing layoffs to the values of firms not announcing layoffs, for each year over a five year period centered on the announcement year. They find that firms announcing layoffs have lower mean values than their comparison firms in the announcement year and in the subsequent two years for four of the five performance measures. They also present a graph that indicates that the mean difference widens during a five-year period for four of their five performance measures. They conclude that firm performance declines in the two years subsequent to layoff announcements.

As noted earlier, Iqbal and Akhigbe, and Abarbanell and Bushee provide some evidence that contradicts the above findings. Since evidence on the association between layoffs and changes in performance is inconsistent, the following hypotheses are stated in null form, i.e., layoffs have no effect on firm performance.

H1a: Financial performance for a firm after a layoff announcement does not differ from the firm's performance in the prior period.

H1b: The change in financial performance for a firm after a layoff announcement does not differ from the change in financial performance for the matching control firm.

Market Reaction

To the extent that layoff announcements provide favorable news not fully expected by the market, stock prices will react positively. Shareholder wealth increases if the market perceives the announcement as a signal that the firm is taking steps to improve its

financial state. However, if the layoff announcements contain unfavorable news not fully anticipated by the market, stock prices will react negatively. Worrell, Davidson and Sharma (1991) find that firm value decreases with poor business prospects. The layoff announcements can cause a decline in shareholder wealth if the market does not fully anticipate the poor prospects. Alternatively, stock prices will not react to the layoff announcements if the announcements contain information which is already known to the market. Since the information in the layoff announcements is already known, stock prices would already have reflected any changes in firm value.

Incremental news on business prospects contained in the layoff announcements determines how stock prices react. Since there is no reason to believe that stock prices would react in a particular direction, the following hypothesis is stated in null form.

H1c: Stock prices do not react to the layoff announcements.

Stratification by Reasons for the Layoffs

Grouping all firms announcing layoffs together would reduce the power of statistical tests and the ability to detect subsequent changes in performance if performance differs according to the reasons for the layoffs. This section explores the major reasons for layoffs and their link with performance.

Research on organizational change suggests that layoffs occur as a result of a reduction in demand, technological development, appointment of new management, or ownership turmoil (e.g. takeovers and LBOs). Mohrman and Mohrman (1989), and Lawrence (1989) discuss the reasons behind organizational changes. Loseby also

discusses reasons for dismissal in his book, Employment Security -- Balancing Human and Economic Considerations. Collectively, they concur that these factors can cause organizational changes which include changing the cost, asset or organizational structures, or even the business emphasis of a company.²⁰

Of the four factors listed above, I focus on reduction in demand and technological development, because I consider these factors to represent changes in the underlying economic status of the firm that lead to a reduced demand for labor. The demand for labor can be reduced because of a lower demand for output and/or a higher productivity of labor. A reduction in demand leads to a reduction in production, whereas technological development improves the productivity per worker thereby allowing the firm to produce similar levels of output using fewer workers. In contrast, the appointment of new management or ownership turmoil simply facilitates changes.²¹

This dual classification is also supported by a survey conducted by the American Management Association. This survey reported by Greenberg (1989), finds that a decline in sales and an improvement in efficiency or productivity due to new technology are the two major reasons for layoffs. In responses given by participants, 42.7% stated actual or

²⁰ Economic literature emphasizes that voluntary departures and layoffs are optimal choices for workers and firms. Efficient-turnover literature [Burdett (1978), McLaughlin (1991)] focuses on modeling voluntary departures or layoffs as optimal decisions supported by equilibrium wages. Search theory introduces adjustment costs to both workers and firms and so influence firm behavior on demand for labor under uncertain demand.

²¹ In her book *Managing Mature Businesses*, Harrigan discusses managerial barriers for taking appropriate action in mature businesses. Following her line of argument, old or existing managers often fail to lay employees off when required because of the manager's own association with the success or failure of the company, or their reluctance to change dramatically, especially when the layoff announcements reflect negative information about the company. New management does not suffer from managerial barriers, and is more willing to change to improve subsequent performance.

forecast business downturn and 30.2% stated improved staff utilization as the reasons for the reduction in workforce.²²

To summarize, the two primary reasons suggested by the literature on organizational change and the American Management Association's survey are reduction of demand and technological development. I refer to these reasons as "reduction in operations" and "improved efficiency", respectively. After identifying the two major reasons for layoffs, this chapter then discusses each reason and goes on to explore how these two reasons affect firm performance surrounding layoff announcements.

Layoffs due to Reduction in Operations

A downturn in demand can lead to a reduction in employment. With a decline in demand, firms are expected to reduce their output, which reduces their demand for employees. The following announcement, which was reported in The Wall Street Journal May 27, 1985, is an example of a layoff announcement that cites an expected sales decline:

Seeq Technology Inc., a maker of semiconductor memory devices, said it will report a "substantial" loss for its second fiscal quarter, ending March 31, that will exceed the \$1.4 million deficit a year earlier. The San Jose, Calif., company Monday announced the layoff of 15% of its work force, cutting employment to 523. It blamed soft conditions in the industry.

²² Reasons for workforce reductions are not exclusive of each other. They are: business downturn (42.7%), improved staff utilization (30.2%), result of merger and acquisition (10.6%), plant or office obsolescence (5.2%), and other (20.3%).

Layoffs due to Improvement in Efficiency

Improved efficiency resulting from new technology or process improvement can also lead to workforce reductions. With improved efficiency, firms require fewer employees to produce the same level of output. Hence, the demand for employees is reduced even though output does not decrease. For example, technological development encourages the substitution of workers with automated equipment. Also, a continuous improvement in the production process and product design increases operating efficiency and reduces the number of employees required, which may result in layoffs. In addition, efficiency can be improved by changing organizational structure, such as decentralization or centralization. According to The Wall Street Journal of August 25, 1989, Campbell Soup announced its plan to restructure for efficiency reasons.

“In a move to boost efficiency and compete more effectively, we will close four U.S. plants and consolidate operations overseas, eliminating about 2,800 jobs.” To boost productivity, Mr. McGovern (president, and chief executive officer) said the company's food processing plants in Ohio, Texas, California and North Carolina will be retrofitted with new technology and will begin to operate on a 24-hour basis.

Framework for Association

As discussed previously, firms announcing layoffs due to an anticipated reduction in operations are expected to suffer reduced demand, leading to reduced output, in turn leading to reduced demand for employees. However, firms announcing layoffs due to improved efficiency are not expected to suffer from reduced demand or reduced output,

but are expected to reduce their demand for employees. I use these general characteristics of the reasons for layoffs to form predictions regarding the association of workforce reduction with firm performance.

The Association between Changes in Output and Accounting Performance

According to the above discussion, output is expected to decrease in the announcement year for firms announcing layoffs due to a projected reduction in operations, while output is expected to remain the same or increase in the announcement year for firms announcing layoffs due to improved efficiency. Based on the above relation between the reasons for the layoffs and change in output, the following graphs illustrate how changes in output affect profitability and productivity, with year 0 as the announcement year and

a = firms announcing layoffs due to a reduction in operations

b = firms announcing layoffs due to improved efficiency

c = firms not announcing layoffs.

Since there is no reason to expect any differences in prior level of output and performance between firms with different reasons for layoffs and between firms with or without layoff announcements, the prior level of output and performance, represented by dotted lines in the graphs, are assumed to be the same among firms. De Meuse, Vanderheiden and Bergmann provides some supporting evidence for this assumption. The prior performance of their sample firms does not differ in three of their five performance measures compared to their comparison firms. This assumption is also evaluated using the data in this study.

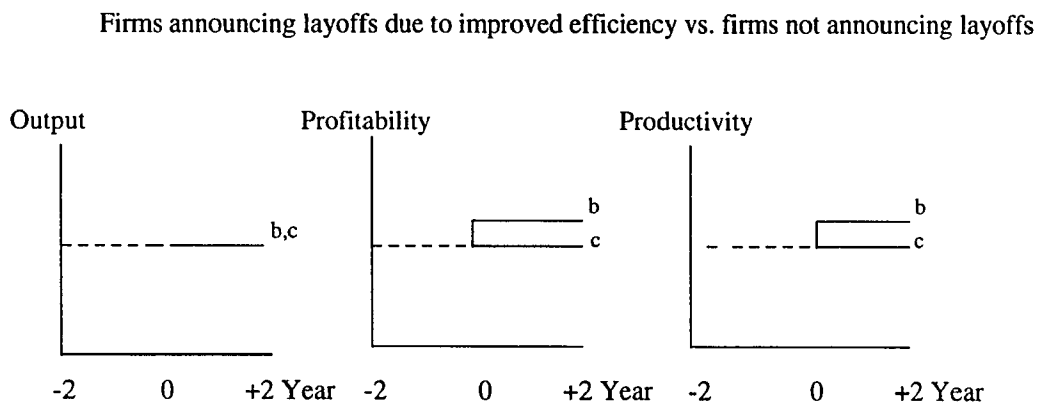
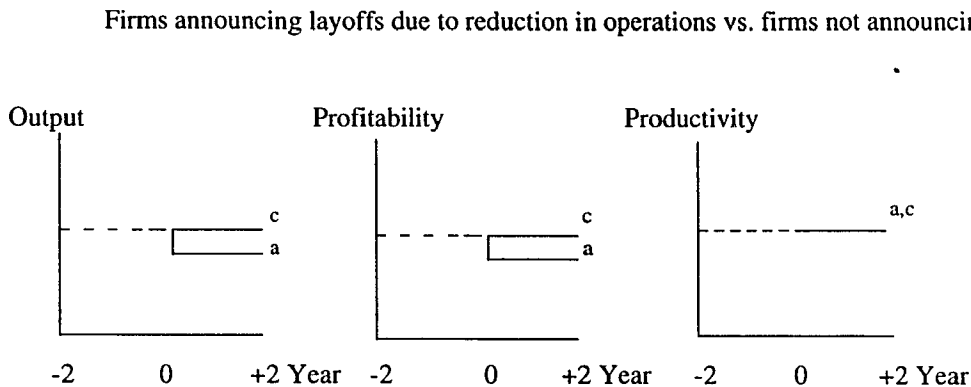


Figure 1. Association between changes in performance and reason for the layoff

Due to different expectations in the subsequent performance of firms reducing their workforce caused by reduction in operations or improved efficiency, the effects of workforce reduction may not be detectable in the combined sample. That is, an increase in profitability for firms reducing their workforce due to improved efficiency can be offset by a decrease in profitability for firms reducing their workforce due to reduction in operations.

Costs of operations include both fixed and variable costs. Variable costs vary in direct proportion to changes in the scale of operations and so can be adjusted easily to

changes in operations. Wages and compensation, which can be changed by varying the number of employees, are generally considered variable in nature. On the other hand, fixed costs are less susceptible to adjustment relative to variable costs. For firms announcing layoffs due to a planned reduction in operations, even though variable costs are reduced by a reduction in employees of similar magnitude, fixed costs are not expected to be reduced immediately. Therefore, I expect profitability to decrease in the subsequent period compared to the prior period. However, I expect productivity to remain the same. For firms announcing layoffs due to improved efficiency, a reduction in employees leads to a reduction in variable costs for the same level of output. I expect both profitability and productivity to increase in the subsequent period. The following hypotheses are stated in alternate form.

Reduction in Operations Subsample

H2a: For a firm announcing a layoff due to an anticipated reduction in operations, profitability after a layoff announcement declines from the firm's profitability in the prior period.

H2b: For a firm announcing a layoff due to a reduction in operations, the change in profitability is less than the change for the matching control firm.

Improved Efficiency Subsample

H3a: For a firm announcing a layoff due to improved efficiency, profitability after a layoff announcement increases over the firm's profitability in the prior period.

H3b: For a firm announcing a layoff due to improved efficiency, productivity after a layoff announcement increases over the firm's productivity in the prior period.

H3c: For a firm announcing a layoff due to improved efficiency, the change in profitability exceeds the change for the matching control firm.

H3d: For a firm announcing a layoff due to improved efficiency, the change in productivity exceeds the change for the matching control firm.

Market Reactions

As discussed in the literature review and earlier in this chapter, Worrell, Davidson, and Sharma categorize layoff announcements according to the reasons stated for layoffs and find some evidence that stock prices react differently based upon the reason stated. This study also examine the reactions of stock prices to the layoff announcements according to reasons for layoffs.

CHAPTER IV

SAMPLE SELECTION

The sample is drawn from the major newspapers and the wire services in the Lexus/Nexis database. The Lexus/Nexis database provides a more complete source of layoff announcements and hence a larger sample than those in the previous studies. I searched the database using the term "layoff" for layoff announcements over a period from 1989 to 1991.

The initial sample includes announcements of reported or future employment reductions for firms incorporated in the US regardless of the magnitude of employees affected. Because the economic environment is likely to differ between foreign and domestic firms, I exclude foreign companies from the sample, and because I am interested in firms announcing layoffs during the ordinary course of business, I exclude layoff announcements following corporate control activities and bankruptcy filings.²³ Layoff announcements resulting from extraordinary events, such as those that are disaster-related, are also excluded. In addition, I exclude layoff announcements with the following aspects: speculation of future layoffs, strike-related layoffs, temporary layoffs, seasonal layoffs, indefinite layoffs, and layoffs with possibility of recall. However, announcements of

²³ Layoff announcements of institutions which are in receivership, declared insolvent, being seized or under supervision of regulators, are excluded from the sample.

Table 1. Sample Selection and Data Availability

	Layoff Announcements during 1989-1991	Number of Individual Firms Announcing Layoffs
Full Sample (1989-1991) ^a	1,089	484
Data available on CRSP ^b	1,052	458
Data available on Compustat ^c	1,010	423
Data available on both Compustat and CRSP	948	397

^a The sample is drawn from major newspapers and the wire services in the Lexis/Nexis database using the keyword “layoff” to identify announcements for the period 1989 to 1991. Announcements by foreign companies, announcements due to extraordinary events, and announcements related to temporary layoffs are excluded from the sample.

^b Firms included in the sample are required to have 4 years data on CRSP centered on the announcement year.

^c Firms included in the sample are required to have 5 years data of employees, sales, total assets income before extraordinary items, and operating income on Compustat centered on the announcement year.

voluntary or involuntary separation are included in the sample.²⁴

I narrowed the sample further by including only those firms that have either four years of data on CRSP, and five years of accounting information on Compustat, with the information centered on an announcement date (or year). For sample firms with multiple

²⁴ The distinction between voluntary and involuntary separation is unclear, especially when employees are being told that a certain goal of employment reduction is being set by the company or that their positions are being eliminated.

layoff announcements over the 3-year period, this study requires that data requirements are met for all the announcements; otherwise, the firm is dropped from the sample.

The selection criteria described above result in a sample of 484 firms. As shown on Table 1, 1,089 announcements are included in this study. Four hundred and twenty three firms (1,010 layoff announcements) meet the data requirement for Compustat, and 458 firms (1,052 announcements) meet the data requirement in CRSP. Three hundred ninety seven firms (948 announcements) meet both the data requirements for CRSP and Compustat. The distribution of SIC codes for the sample firms relative to the Compustat population is reported in Table 2. According to Table 2, 44% of the sample firms are in the manufacturing business compared to 25% in Compustat, which suggests that certain industries are more susceptible to the changes in economic environment.²⁵ A Kolmogorov-Smirnov test on two-digit SIC rejects that the sample firms and the Compustat active companies have the same distribution.

Because firm performance is likely to be influenced by economy-wide or industry-wide changes, a matched-pair comparison is used to control for changes in performance induced by these non firm-specific factors. The control sample is selected from firms with the same 2-digit SIC code and with the smallest difference in total assets to the sample firm in the announcement year.²⁶ The announcement year (year 0), the announcement

²⁵ Financial institutions are underrepresented in the sample compared to the Compustat population. One possible explanation is a data limitation on Compustat. Compustat did not have complete information on financial institutions. Thus financial institutions announcing layoffs are more likely to be deleted from the sample with the 5 year data requirement centered on event year. A Kolmogorov-Smirnov test on 2-digit SIC rejects that the sample firms and the Compustat active companies have the same distribution. Results are similar when closed end mutual funds are excluded from both the sample and the Compustat population.

²⁶ This study uses Compustat SIC in matching firms by industry. Guenther and Rosman (1994) compare

quarter (quarter 0) and the announcement day (day 0) are determined by the announcement dates in the Lexus/Nexis database. For firms with multiple layoff announcements during the sample period, the first announcement is used to determine the announcement year. Since annual data are used in determining the starting period, data from the previous fiscal year are closer to the announcement date of layoffs made in the first fiscal quarter and are more likely to provide information regarding workforce reductions than annual data from that fiscal year which is at least 9 months after the layoff. I therefore use the last fiscal year is used as the announcement year for announcements made in the first fiscal quarter. In addition to the above matching criteria, firms announcing layoffs in the same period, between 1989 and 1991, are excluded from the control sample.

Based on the matching criteria, a control sample was selected for the 423 firms in the Compustat sample. Comparing the total assets of the sample firms and the control firms, 233 matches are within 10%, 301 matches are within 25% , 354 matches are within 50%, 396 matches are within 75%, and all 423 matches are within 100% of the sample firm's total assets. Since some of the sample firms have the same control firm, the number of control firms totals 275.

Table 3 reports the mean and the median on selected variables on the announcement year. The mean values are different from the median values due to some extremely large observations. Therefore, median values are emphasized in the subsequent

SIC codes assigned to companies by Compustat and CRSP. They find significant differences on SIC codes assigned. They also find that correlations of monthly stock returns are larger while variances are smaller within industry when Compustat SIC codes are used.

Table 2. Distribution of Industries Represented in the Sample
in Comparison to All Compustat Active Companies^a

SIC ^b	Sample		Compustat	
	Number	%	Number	%
Agriculture	0	0.00	34	0.37
Mining	10	2.36	581	6.30
Food, apparel, and paper products	81	19.15	1,172	12.80
Rubber, leather, and glass products; metal, machinery and computer equipment	188	44.44	2,199	24.00
Transportation, communication, and utility service	53	12.53	763	8.30
Wholesale and retail	25	5.91	901	9.80
Financial institutions	42	9.93	2,316	25.20
Services	19	4.49	766	8.40
Health, legal and education services	5	1.18	374	4.10
Government	0	0.00	63	0.69
Total	423	100.00	9,169	100.00

^a A Kolmogorov-Smirnov test on 2-digit SIC rejects the null hypothesis that the sample firms and the Compustat active companies has the same distribution before and after excluding closed end mutual funds from financial institutions.

^b Industries are identified by single digit SIC code extracted from Compustat 1993.

discussion. As shown on Table 3, despite the match on size, sample firms tend to be larger in terms of output and total assets than their comparison firms. Also, sample firms tend to perform poorly relative to their average comparison firms in ROE, market to book value of equity and operating income to sales. On the other hand, productivity, by output per employee, is higher for the sample firms than their comparison firms. The difference in the debt to equity ratio is not statistically significant.

Table 3. Descriptive Statistics for Firms Announcing Layoffs in the Announcement Year

Variables ^a	Sample			Control			Difference ^b	
	Mean	Median	Std	Mean	Median	Std	Mean	Median
Output	4,052.42	1,029.15 (n=416)	9,925.94	1,455.62	866.02 (n=418)	1,734.56	2,636.71 *** (n=411)	150.13 ***
Total Assets	9,828.87	1,775.30 (n=423)	22,983.00	4,604.84	1,655.10 (n=423)	9,143.91	5,224.03 *** (n=423)	20.25 ***
Debt to Equity	2.05	0.70 (n=423)	13.51	3.34	0.65 (n=423)	14.50	-1.29 (n=423)	0.05
ROE (%)	-58.75%	7.30% (n=423)	1031.60%	-1.34%	10.20% (n=423)	82.93%	-57.40% (n=423)	-4.40% ***
Market to Book Ratio of Equity	1.84	1.32 (n=414)	4.46	2.19	1.52 (n=376)	2.63	-0.3683 (n=369)	-0.31 ***
Operating Income to Sales (%)	2.94%	6.93% (n=423)	40.10%	7.81%	9.26% (n=423)	34.30%	-4.86% ** (n=423)	-2.98% ***
Output per Employee	146.25	86.38 (n=416)	429.83	120.92	82.50 (n=418)	202.48	26.74 (n=411)	6.84 *
Beta ^c	1.104	1.073						

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

^a All monetary variables are in millions and employee figures are in thousands.

^b Statistically significant is assessed using a t-test on means and a Wilcoxon signed-ranks test on medians.

^c Beta on 1052 announcements is calculated from the market model with returns from the size-adjusted index as the market returns and day -291 to day -90 as estimation period. Mean beta is 1.028 and median beta is 1.069 with returns from the value-weighted index as the market returns.

Table 4. Percentage Changes in Employment Level
for Sample and Control Firms^a
(n=423)

Period	Percentage Changes in Employment Levels ^b							
	Sample		Control		Difference ^c			
	Mean	Median	Mean	Median	Mean	p-value	Median	p-value
Year -1 to Year 0	-3.85%	-2.89%	6.58%	2.11%	-10.43%	(0.0001)	-5.08%	(0.0001)
Year 0 to Year +1	-3.59%	-2.82%	0.89%	0.00%	-4.48%	(0.0004)	-2.57%	(0.0001)
Year +1 to Year +2	-2.31%	-2.53%	1.67%	-0.52%	-3.98%	(0.0025)	-3.25%	(0.0001)
Year 0 to Year +2	-5.15%	-5.42%	3.39%	-1.40%	-8.54%	(0.0001)	-6.20%	(0.0001)
Year -1 to Year +2	-7.99%	-8.81%	13.54%	1.20%	-21.53%	(0.0001)	-11.18%	(0.0001)

^a Employment levels are obtained from Compustat. P-values (in parentheses) are based on a matched-pair with t-test on means and Wilcoxon signed-ranks test on medians on the differences between sample and control firms.

^b Percentage changes in employment level are calculated by subtracting the employment level in a earlier year (t-1) from that of the later year (t) and then divided by the employment level at year t.

^c Differences in changes in employment level are calculated by subtracting values of the control firm from that of the sample.

Table 4 presents the percentage changes in employment level. As expected, sample firms have a larger reduction in employees than their comparison firms in the announcement year. In addition, sample firms reduce their workforce by a larger percentage in the subsequent two years than their comparison firms. As shown in Table 4, the biggest percentage reduction in employment levels is the period year -1 to year +2. This finding is consistent with firms laying employees off over a period of time when a large number of employees are affected by the layoff.

CHAPTER V

DATA ANALYSIS

The following analysis plan is organized by hypothesis, with tests performed first on the full sample of firms and then followed by tests on firms grouped by reasons for layoffs.

Analysis on the Entire Sample

Accounting Performance Measures

De Meuse, Vanderheiden and Bergmann compare mean values of five performance measures, which are: profit margin on sales, return on assets, return on equity, sales to total assets, and market to book value of equity. In addition to the five performance measures used in De Meuse, Vanderheiden and Bergmann's study, I include additional performance measures of profitability, operating income and pretax income, and productivity, sales per employee and output per employee.

Because a workforce reduction is an operational change, measuring profitability by operating income reflects the impact on operations caused by layoffs. Workforce reductions generally involve significant charges to earnings on or after the announcement years and that could cause a bias towards a deterioration in performance. Thus, it is

necessary to compare performance measures with and without layoff-related charges. Firms are not required to disclose layoff-related charges. When firms do disclose layoff-related charges, they are frequently included in restructuring charges. Operating income collected from Compustat excludes restructuring charges and so provides a good measure of operating performance ignoring restructuring charges.²⁷ I also use pretax income as a measure of profitability. Pretax income includes layoff-related charges or restructuring charges, which provides a measure of a firm's performance taking into consideration the magnitude and frequency of layoff-related charges or restructuring charges. However, pretax income includes income or expenses which are not related to operations.

Since the level of profitability is affected by the assets employed or sales generated, each of these performance measures is scaled by sales and the book value of average assets respectively, to form a return measure which can be compared across time and across firms. The change in performance is computed over the period from one year prior to the layoff announcements to two years subsequent to the layoff announcements. I use a t-test on mean values and a Wilcoxon signed-ranks test on median values to assess the statistical significance.

I use sales per employee and output per employee as measures of productivity. Because data on units produced are not available, I measure productivity in dollars rather than in units. Output is defined as the sum of cost of goods sold and the change in inventory balances for the year.²⁸ The potential problems in measuring output using the

²⁷ Regardless of the treatment of restructuring charges by individual firm, Compustat records restructuring charges under the line item "special charges".

²⁸ Sales per employee is the only measure of productivity for service firms that do not have output data.

above definition, are discussed later in this chapter. The change in productivity for sample firms is calculated by deducting sales per employee or output per employee one year prior to the announcement year from the two years subsequent to the announcement year. Changes in productivity are also calculated relative to the control sample for the above time period. Statistical significance is measured by a t-test on means and a Wilcoxon signed-ranks test on medians.

Appendix B lists the detailed definition of each performance measure. Pairwise Pearson correlation and the p-value are calculated for performance measures. I find that performance measures can be separated into two groups with high correlation between members of the same group. As expected, output per employee, sales per employee and sales to assets are in the same group while the rest of the performance measures are in the other group.²⁹

Tests on Operating Performance

Hypotheses 1a and 1b state that performance is unaffected by the layoff announcements. Tests concerning the validity of the above hypotheses include examining the performance of sample firms each year over the 5-year period and calculating the percentage changes between the subsequent and the prior performance, which is one year before to two years after the announcement year.

Table 5 presents the adjusted performance measures of the sample firms on each year for the 5-year period. Most of the performance measures for the sample and the

²⁹ Spearman correlation is also calculated and the findings are similar, with the exception that sales to assets has a higher correlation with some performance measures than the Pearson correlation.

Table 5. Performance Measures of Sample Firms Adjusted for Performance of Control Firms Formed Based on a Match-pair^{a,b,c}

Performance	Year -2	Year-1	Year 0	Year +1	Year +2
Profit Margin on Sales (%)					
Mean	-0.59%	-0.85%	-3.69%	-12.08%	-149.89%
Median	-0.15%	-0.24%	-2.15% ***	-0.75% **	-0.75% **
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)
Return on Assets (%)					
Mean	-0.63%	-0.30%	-3.63% ***	-2.19% **	-1.80% *
Median	0.00%	-0.10%	-1.40% ***	-0.60% **	-0.50% *
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)
Return on Equity(%)					
Mean	2.46%	-14.84% **	-83.12%	-42.31%	3.59%
Median	-0.65%	-0.40%	-5.20% ***	-1.20% **	-1.70%
	(n=422)	(n=423)	(n=423)	(n=423)	(n=423)
Sales to Total Assets					
Mean	0.0716 *	0.0678 **	0.0487	0.0235	0.0265
Median	0.0272 ***	0.0152 **	0.0105	0.0064	0.0110
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)
Market to Book Ratio of Equity					
Mean	0.14	-0.58 **	-0.37	-0.87 *	-0.84
Median	-0.01	-0.10 **	-0.31 ***	-0.23 ***	-0.27 ***
	(n=374)	(n=380)	(n=369)	(n=364)	(n=361)
Operating Income to Sales (%)					
Mean	-1.95%	-2.66%	-4.86% **	-9.85%	-41.70%
Median	-0.86% *	-1.62% ***	-2.98% ***	-1.46% ***	-1.26% **
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)
Operating Income to Total Assets (%)					
Mean	0.59%	-0.96%	-3.35% ***	-2.33% ***	-1.54% **
Median	0.02%	-0.16%	-1.37% ***	-0.83% ***	-0.91% **
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)
Pretax Income to Sales (%)					
Mean	-0.55%	-0.95%	-4.42% *	-12.69%	-150.39%
Median	-0.70%	-0.59%	-3.08% ***	-1.10% **	-1.36% **
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)
Pretax Income to Total Assets (%)					
Mean	0.99%	-0.27%	-4.52% ***	-2.80% ***	-2.22% **
Median	0.01%	-0.28%	-2.09% ***	-0.67% ***	-0.68% *
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)
Sales per Employee					
Mean	11.233	9.358	10.517	14.363	13.165
Median	8.258 ***	7.981 *	7.321 **	7.720 **	9.356 ***
	(n=423)	(n=423)	(n=423)	(n=423)	(n=423)

Table 5. (Continued)

Performance	Year -2	Year-1	Year 0	Year +1	Year +2
Output per Employee					
Mean	15.1293 *	10.4772	21.2065	23.9968 **	25.4587
Median	4.3225 *** (n=390)	4.3993 * (n=411)	5.8766 ** (n=411)	6.7589 *** (n=410)	5.7045 *** (n=410)

*** Significant at 0.01 level

** Significant at 0.05 level

* Significant at 0.10 level

^a De Meuse, Vanderheiden and Bergmann compare mean values of the first five performance measures of their sample firms with their control firms. They find that the sample firms perform worse than their control firms in the announcement year and in each year of the following two years for four of their five performance measures.

^b Adjusted performance is the performance of the sample firms after deducting the performance of their control firms. Statistical significance is assessed using a t-test on means and a Wilcoxon-signed-ranks test on medians.

^c All monetary variables are in millions and employee figures are in thousands.

control firms do not differ statistically in the prior period. The finding suggests that the performance of the sample firms do not perform more poorly than their control firms in the period prior to layoff announcements, which is consistent with an earlier assumption discussed in Chapter III.

However, in the announcement year and in the subsequent two years, sample firms perform poorly relative to control firms. Profitability measures, with the exception of sales to total assets, are consistently negative and statistically significant in the announcement year and in the following two years.³⁰ Further, the decline in profitability

³⁰ The positive and statistically significant adjusted sales to total assets in the prior two years but insignificant in the announcement year and in the subsequent two years can be explained by the fact that sample firms are associated with a higher sales to total assets in the period prior to the announcement year and a lower growth in sales compared to their control firms during the 5-year period.

of the sample firms is not caused by the inclusion of restructuring charges in profitability measures because the operating income to sales ratio does not include restructuring charges. The negative adjusted profitability measures of the sample firms support the finding by De Meuse, Vanderheiden and Bergmann.

Although sample firms perform poorly with regard to profitability, i.e., median adjusted performance measures are negative, their productivity measures exceeds that of the control firms following layoff announcements. The improvement in adjusted productivity measures is driven by a larger reduction in employment in sample firms than their control firms. Therefore, despite the fact that control firms have a larger increase in median sales and a generally increasing median output over the five-year period, sample firms appear to perform better when sales or output is scaled by the number of employees.

Figure 2 illustrates in graph form the above discussion. In Figure 2, median values of selected performance measures for the sample firms and the control firms are plotted over a period centered on announcement year. Median values of the sample and the comparison firms are similar in years prior and subsequent to the announcement year, with the exception of a sharp drop of the median values of the sample firms in the announcement year. In addition, profitability measures, with the exception of the market to book ratio of equity, exhibit a downward trend, while productivity measures exhibit an upward trend over the period for both sample and control firms.

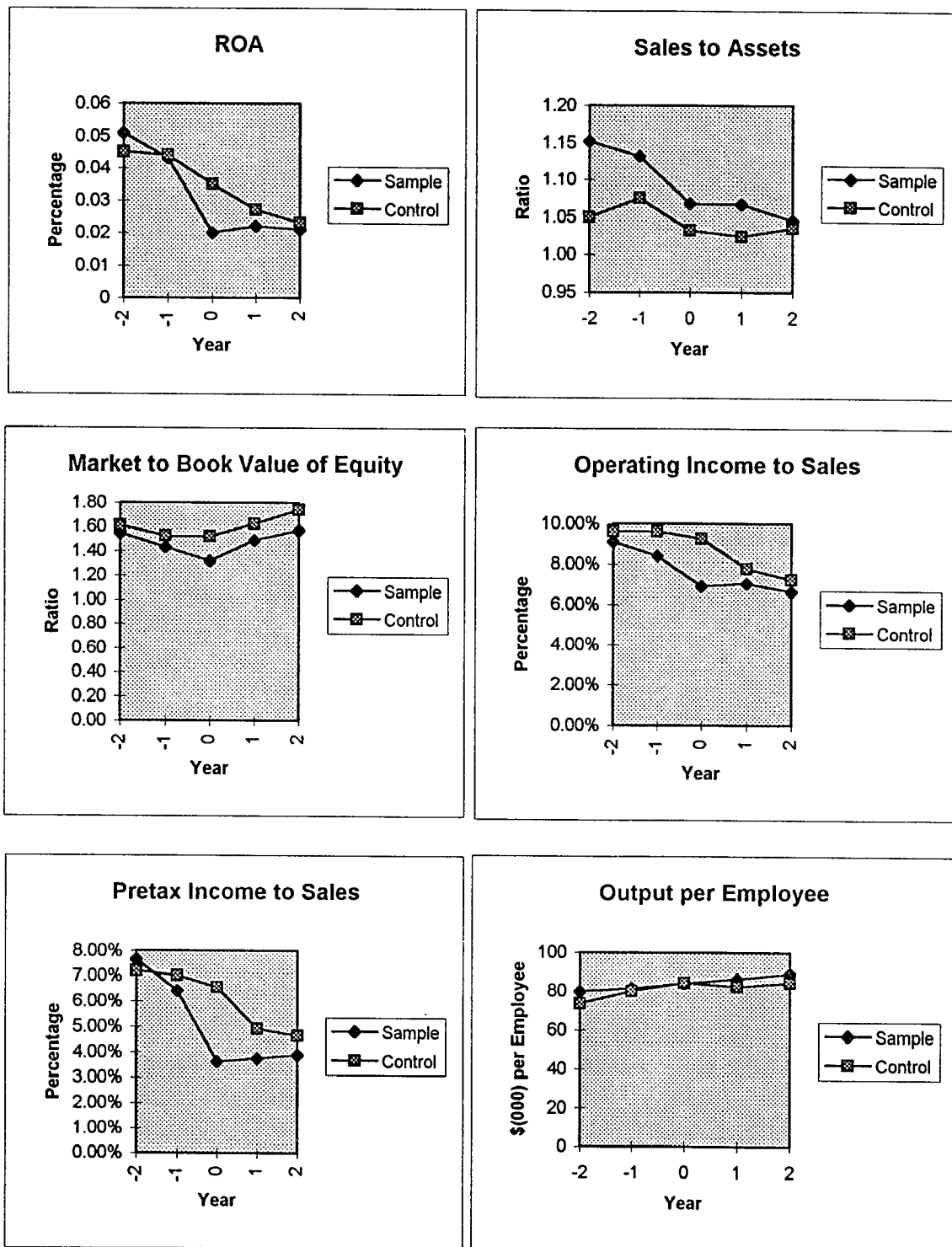


Figure 2. Median Values on Selected Variables for the Entire Sample

Table 6. Percentage Changes in Performance for the Sample Firms
Subsequent to Layoff Announcements

Performance Variables	Percentage Changes in Performance ^{a,b}			
	Unadjusted ^c		Adjusted ^d	
Profit Margin on Sales				
Mean	-221.72	(0.2581)	-154.98	(0.4306)
Median	-26.43	(0.0001)	-6.15	(0.4513)
	(n=423)		(n=423)	
Return on Asset				
Mean	-227.33	(0.0278)	-156.74	(0.1282)
Median	-32.31	(0.0001)	-9.61	(0.2592)
	(n=422)		(n=420)	
Return on Equity				
Mean	-162.11	(0.7208)	-206.55	(0.6518)
Median	-23.68	(0.0001)	-13.80	(0.1778)
	(n=423)		(n=423)	
Sales to Total Assets				
Mean	-2.07	(0.1823)	-6.61	(0.0125)
Median	-4.94	(0.0001)	0.65	(0.1135)
	(n=423)		(n=423)	
Market to Book Ratio of Equity				
Mean	35.21	(0.0872)	-24.92	(0.6759)
Median	5.83	(0.0028)	-1.84	(0.9713)
	(n=409)		(n=356)	
Operating Income to Sales				
Mean	128.09	(0.3160)	148.04	(0.2476)
Median	-12.74	(0.0001)	-1.00	(0.9454)
	(n=423)		(n=421)	
Operating Income to Total Assets				
Mean	140.94	(0.2207)	155.48	(0.1818)
Median	-17.30	(0.0001)	-7.03	(0.3380)
	(n=423)		(n=421)	
Pretax Income to Sales				
Mean	-149.80	(0.3237)	-116.19	(0.4484)
Median	-27.52	(0.0001)	-6.93	(0.4851)
	(n=423)		(n=423)	
Pretax Income to Total Assets				
Mean	-77.05	(0.1301)	-46.40	(0.3928)
Median	-32.41	(0.0001)	-11.71	(0.3016)
	(n=423)		(n=423)	
Sales per Employee				
Mean	16.77	(0.0001)	0.13	(0.9599)
Median	13.26	(0.0001)	0.23	(0.6444)
	(n=423)		(n=423)	

Table 6. (Continued)

Performance Variables	Percentage Changes in Performance ^{a,b}			
	Unadjusted ^c		Adjusted ^d	
Output per Employee				
Mean	18.03	(0.0001)	-8.39	(0.4781)
Median	11.17	(0.0001)	1.86	(0.2024)
	(n=413)		(n=408)	

^a P-values (in parentheses) are based on a t-test on means and a Wilcoxon signed-ranks test on medians for the null hypothesis that mean (median) change in performance is zero.

^b All monetary variables are in millions and employee figures are in thousands.

^c Percentage changes in unadjusted performance is computed by calculating the change in performance of the sample firms over the period year -1 to year +2.

^d Percentage change in adjusted performance is computed by calculating the change in performance of the sample firms over the period year -1 to year +2 and then deducting the change in performance of their control firms over the same period.

As shown in Table 6, sample firms have declining profitability compared to the prior period but the decline in profitability is not statistically significant relative to control firms in the same industry. Table 6 reports the changes in performance before and after adjusting for the control firms. The unadjusted changes in performance confirm the declining trends depicted in Figure 2. With the exception of the market to book ratio of equity, the unadjusted changes in profitability for year -1 to year +2 are negative and statistically significant. Based on the above findings, I reject the null hypothesis that the change in performance for the sample firms does not differ from zero. Although after adjusting for the performance of their control firms, sample firms still perform poorly than their control firms, the differences are not statistically significant. Similarly, although productivity of the sample firms, measured by sales per employee and output per

employee, improves over the same period, the improvement in productivity for the sample firms disappears after adjusting their measures with those of the control firms for the period year -1 to year +2. Based on this evidence, I cannot reject the null hypothesis that sample firms and control firms have similar changes in performance.

The negative profitability measures of sample firms, particularly operating income to sales, do not provide supporting evidence on the association between layoff activities and an improvement in operating performance. One possible interpretation of these results on the entire sample is that both the sample and the control firms are affected by similar economic or industry factors which drive their profitability down. There are several other explanations for not finding an improvement in subsequent performance. Because the financial performance of sample firms facing different economic situations are expected to be different, pooling sample firms together makes it difficult to detect improvements in subsequent performance. This is examined in the following section. Another possible explanation is that the performance of the sample firms could be worse if layoffs had not taken place. However, there is no evidence on this line of reasoning due to the similarity in performance two years prior to and two years subsequent to the announcement year as shown in Figure 2. Finally, one can argue that two years subsequent to the year of the first layoff announcement may not be sufficient to capture the benefits of layoff activities, which could be one of the reasons why Iqbal and Akhigbe find an improvement in subsequent performance while this study does not.³¹

³¹ See footnote 16.

Stock Price Reaction

Since the information content of layoff announcements is not clear, H1c states that layoff announcements are not expected to be associated with favorable or unfavorable stock price reactions, as measured by cumulative prediction errors. This study uses returns for the size-adjusted index from CRSP as the market returns and then calculates predicted returns using the market model. Cumulative prediction errors are then calculated by accumulating the difference between predicted returns from actual returns. A z-statistic is used to evaluate the statistical significance of abnormal stock returns during the announcement period.³²

Table 7 presents the mean and the median prediction errors for 10 intervals.³³ The mean and the median prediction errors are generally negative in the period prior to or on the date of layoff announcements. In particular, there is a significant negative stock price reaction for the two day interval, day -1 to day 0. However, the mean and the median cumulative prediction errors are significantly positive for the period subsequent to the layoff announcement (day +1 to +90), and are not significant for the period day -90 to day +90.³⁴ The negative market reactions to the layoff announcements support the findings of Worrell, Davidson and Sharma but reject the null hypothesis that stock prices do not react to layoff announcements. The finding of negative market reactions can be

³² Z-statistics are calculated using the method of Mikkelson and Partch (1988).

³³ Worrell, Davidson and Sharma examine stock price reactions to the layoff announcements over 9 intervals. This study adds a two-day interval, day -1 to day 0.

³⁴ Similar results are obtained when returns from the value-weighted index are used as market returns.

Table 7. Mean and Median Cumulative Prediction Errors Around the Announcement Day for 1052 Layoff Announcements During 1989 to 1991

	Mean and Median Cumulative Prediction Errors ^a									
	Days									
	-90 to +90	-90 to -5	-5 to +5	-2	-1	0	-1 to 0	+1	-1 to +1	+1 to +90
Mean	0.0198	-0.0304	-0.0120	0.0004	-0.0018	-0.0062	-0.0080	-0.0011	-0.0091	0.0603
p-value ^b	(0.1281)	(0.0001)	(0.0004)	(0.7353)	(0.1046)	(0.0001)	(0.0001)	(0.4335)	(0.0001)	(0.0001)
(Z-statistic) ^b	0.59	-4.32	-3.89	1.23	-1.52	-6.42	-5.58	-3.98	-6.85	6.03
Median	0.0034	-0.0200	-0.0056	-0.0008	-0.0013	-0.0022	-0.0024	-0.0021	-0.0030	0.0220
p-value ^b	(0.7814)	(0.0001)	(0.0007)	(0.1559)	(0.0136)	(0.0002)	(0.0161)	(0.0009)	(0.0016)	(0.0025)
% negative	49.52%	53.61%	55.23%	52.19%	53.80%	55.70%	53.71%	55.13%	54.85%	45.25%

^a The cumulative prediction errors are obtained from prediction errors estimated by the market model with returns from the size-adjusted index as the market returns, and day -291 to day -91 as estimation period.

^b P-values (in parentheses) are based on a t-test on means and a Wilcoxon signed-ranks test on medians for the null hypothesis that the mean (median) cumulative prediction error is zero. Z-statistic is calculated using the method of Mikkelson and Partch (1988).

interpreted as layoff announcements revealing bad news, which contradicts the favorable opinions expressed by popular press. As to the significantly positive cumulative prediction errors in the period, day +1 to day +90, this study has no explanation for such market reactions.³⁵

Partitioned on the Reasons for the Layoffs

As discussed earlier in this chapter, pooling sample firms with different economic situations together may reduce the ability to detect an improvement in subsequent performance. Therefore, I group sample firms into subsamples according to the reasons for the layoffs and then report the test results for each subsample. Two stratification methods are used in an attempt to capture the reasons for the layoffs. This section starts with an examination of changes in employment, and follows with an analysis of changes in the performance of the subsamples. The previous tests on the sample firms are now performed on firms classified by the above two stratification methods. In addition to examining hypotheses on layoffs driven by anticipated reduction in operations and improved efficiency, I make comparisons between subsamples to determine whether or not the “improved efficiency subsample” performs better than the “reduction in operations subsample”.

Stratification Methods

First, firms announcing layoffs are stratified into “reduction in operations” and

³⁵ Worrell, Davidson and Sharma find a positive but statistically insignificant cumulative prediction errors for the period day +1 to day +90.

“improved efficiency” groups according to the reason stated in the layoff announcement. Firms are classified as “reduction in operations” if the reason stated in layoff announcements is to improve profitability or to adapt to reduced demand or a slower economy.³⁶ Firms are classified as “improved efficiency” if the reason stated in layoff announcements is to improve efficiency or competitiveness and the announcements do not indicate any actual or anticipated reduction in sales or profit. Otherwise, firms are grouped together under “others”. Table 8 describes the sample distribution by reason for layoffs. Panel A of Table 8 contains the number of announcements in each subgroup by year. Since some sample firms have more than one layoff announcement over the 3-year period, and the reason stated can be different for each announcement, I consolidate multiple announcements with different stated reasons for a given firm.³⁷ The number of firms and their stated reasons are reported in Panel B of Table 8.

However, classifying layoff firms based on the information contained in the announcement can be subjective as well as problematic. Therefore, I also use the change in output, computed as the difference between output in year 0 and year -1 scaled by output on year -1, as a second stratification method. Output is the sum of cost of goods sold and change in inventory balances as defined earlier. Specifically, layoffs are considered to be driven by anticipated reduction in operations if the output in the announcement year is less than that of the previous year by 5%, while those in which the

³⁶ Some firms that announced layoffs to reduce cash flow problems are included in the reduction in operations subgroup even though they are probably different from the rest of the subgroup in terms of subsequent actions.

³⁷ For firms with multiple announcements, the first announcement is used in determining the announcement date.

Table 8. Sample Distribution by Reason for Layoffs

Year	Reduction in Operations	Improved Efficiency	Others	Total Announcements
Panel A: Reasons Stated in Layoff Announcements				
1989	123	39	91	253
1990	215	54	95	364
1991	284	50	138	472
Total	622	143	324	1,089

	Reduction in Operations	Improved Efficiency	Others	Total Firms
Panel B: Partitioned on the Stated Reasons for Layoffs ^a				
Number of Firms	266	52	105	423

	Reduction in Operations	Improved Efficiency	Others	Total Firms
Panel C: Partitioned on Changes in Output ^b				
Number of Firms	110	178	128	416

Panel D: Common Categories of the Two Stratification Methods (n=416 firms)^c

Stated Reason	Changes in Output		
	Reduction in Operations	Improved Efficiency	Others
Reduction in Operations	73	107	81
Improved Efficiency	11	23	18
Others	26	48	29

^a Multiple layoff announcements with different stated reasons for the same firm are consolidated during the process of classifying firms into groups with different reasons for layoffs.

^b Output is measured by the sum of cost of goods sold and the changes in inventory balances. Sample firms are classified as reduction in operations when output in the announcement year is less than that of the previous year by 5 percent. Sample firms are classified as improved efficiency when output in the announcement year is greater than that of the previous year by 5 percent.

^c A Chi-square statistic of 1.892 (p=0.756) cannot reject the null hypothesis that the two stratification methods group sample firms into subsamples independently.

output in the announcement year is greater than that of the previous year by 5% are considered to be driven by improved efficiency. Otherwise, firms are grouped under “others”. Panel C of Table 8 includes a number of firms with different reasons for layoffs, partitioned according to the changes in output of the sample firms. Panel D of Table 8 presents the common categories of subsamples formed using the two stratification methods. The number of firms stratified by output is not equal to the number of firms stratified by the stated reasons because seven sample firms do not have data on output in year -1 and year 0 and are excluded when sample firms are stratified according to change in output. Even though the two stratification methods intend to categorize the sample similarly, a Chi-square test cannot reject that the two stratification methods group sample firms independently.³⁸

Descriptive Statistics on Subsamples

Table 9 presents the means and the medians for selected variables for firms grouped by reasons for the layoffs. Panel A presents subsamples formed according to the reason stated in layoff announcements and Panel B presents subsamples formed according to changes in output. Each subsample is compared to its control firms and the statistical significance of median differences is assessed by a Wilcoxon signed-ranks test, which is reported in footnotes 2 and 6 of Table 9. Similar to results in Table 3, subsamples tend to be larger in output and total assets. The “improved efficiency subsample” formed

³⁸ A Chi-square statistic of 1.892 with a probability of 0.756 is obtained in comparing the two stratification methods.

according to the reason stated in layoff announcements has a lower market to book ratio of equity but similar ROE and operating income sales relative to its control firms, while the remaining subsamples are lower in all three profitability measures. The last column in Panel A and Panel B reports the p-values of comparing the “reduction in operations subsample” to the “improved efficiency subsample”. The “improved efficiency subsamples” formed under both stratification methods are larger in output and total assets, and perform better in ROE, market to book ratio of equity and operating income to sales. However, the debt to equity ratio is not statistically different for the two subsamples. Although the higher profitability measures associated with the “improved efficiency subsample” support the claim that layoffs are driven by improved efficiency, there is no explanation as to the difference in size between the two subsamples.

Table 10 shows that subsamples are associated with workforce reductions during the period year -1 to year +2. The percentage reduction in employees for each subsample is significantly higher than that of its control firms. Also, the reduction in workforce is the largest when comparing year +2 to year -1, after adjusting for changes in workforce incurred in the control firms and the percentages are statistically significant.

Accounting Performance of Subsamples

After grouping sample firms into subsamples, each performance measure of the subsample is compared with that of their control firms for each year of the 5-year period. Then the subsequent performance for the subsamples is compared with their performance prior to announcing layoffs as well as with the performance of the control firms.

Table 9. Descriptive Statistics for Firms Announcing Layoffs in the Announcement Year
Partitioned on Reasons for the Layoffs^a

Variables ^c	Subsamples ^b									Reduction in Operations vs. Improved Efficiency	
	Reduction in Operations			Improved Efficiency			Others			P-value ^d	
	Mean	Median	Std	Mean	Median	Std	Mean	Median	Std	Mean	Median
Panel A: Partitioned on Stated Reason											
Output	3,779.59	688.26 (n=261)	9,731.92	4,922.85	2,140.48 (n=52)	11,135.32	4,304.32	1,274.71 (n=103)	6,838.80	(0.4927)	(0.0036)
Total Assets	9,355.99	1,018.64 (n=266)	25,379.20	13,471.68	5,397.66 (n=52)	22,648.63	9,222.76	2,326.34 (n=105)	15,588.34	(0.2439)	(0.0001)
Debt to Equity	2.51	0.65 (n=266)	16.81	1.83	0.84 (n=52)	5.99	0.99	0.70 (n=105)	1.17	(0.6046)	(0.1451)
ROE (%)	-97.11	6.10 (n=266)	1299.92	13.73	10.80 (n=52)	58.57	2.55	8.40 (n=105)	24.24	(0.1667)	(0.0275)
Market to Book Ratio of Equity (MKBKE)	1.66	1.24 (n=261)	3.51	2.86	1.71 (n=50)	9.75	1.80	1.46 (n=103)	1.68	(0.3942)	(0.0104)
Operating Income to Sales (%)	-0.81	5.24 (n=266)	49.40	12.32	12.62 (n=52)	8.00	7.79	8.34 (n=105)	12.70	(0.0001)	(0.0001)
Output per Employee	115.60	80.26 (n=261)	116.70	279.79	92.16 (n=52)	1202.03	137.02	95.15 (n=103)	131.04	(0.3544)	(0.9138)
Beta ^c	1.0899	1.0719		1.0861	1.0858		1.1404	1.0658			

Table 9. (Continued)

Variables ^c	Subsamples ^f									Reduction in operations vs. improved efficiency	
	Reduction in Operations			Improved Efficiency			Others			P-value ^d	
	Mean	Median	Std	Mean	Median	Std	Mean	Median	Std	Mean	Median
Panel B: Partitioned on changes in output											
Output	1,856.41	372.77 (n=110)	4,334.16	4,545.20	1,349.90 (n=178)	10,970.89	5,254.35	1,459.30 (n=128)	11,493.79	(0.0038)	(0.0001)
Total Assets	6,793.93	572.74 (n=110)	16,532.87	9,029.69	2,506.41 (n=178)	20,022.38	11,857.13	2,658.38 (n=128)	27,861.38	(0.3053)	(0.0002)
Debt to Equity	1.58	0.58 (n=110)	5.15	1.31	0.71 (n=178)	4.69	3.37	0.75 (n=128)	23.44	(0.6518)	(0.1834)
ROE (%)	-32.13	0.70 (n=110)	233.92	6.41	10.40 (n=178)	78.90	-175.50	7.20 (n=128)	1860.11	(0.0979)	(0.0001)
Market to Book Ratio of Equity (MKBKE)	1.46	1.02 (n=106)	2.92	1.64	1.39 (n=174)	2.26	2.43	1.39 (n=127)	7.11	(0.5808)	(0.0039)
Operating Income to Sales (%)	-3.63	4.65 (n=110)	68.70	5.47	8.24 (n=178)	20.60	4.57	7.30 (n=128)	24.80	(0.1790)	(0.0010)
Output per Employee	110.54	72.80 (n=110)	144.17	175.17	94.25 (n=178)	655.56	121.04	85.93 (n=128)	107.19	(0.2940)	(0.0230)
Beta ^e	1.0803	1.0110 (n=175)		1.1289	1.1207 (n=430)		1.0362	1.0443 (n=353)			

Table 9. (Continued)

Variables ^c	Subsamples ^f									Reduction in operations vs. improved efficiency	
	Reduction in Operations			Improved Efficiency			Others			P-value ^d	
	Mean	Median	Std	Mean	Median	Std	Mean	Median	Std	Mean	Median

^a Stratification is done by a) the stated reason for layoffs in the layoff announcements or b) changes in output. Sample firms are classified as reduction in operations when output on the announcement year is less than the previous year by 5 percent, and are classified as improved efficiency when output on the announcement year is larger than the previous year by 5 percent.

^b In addition to reporting mean and median values of subsamples, median values on differences and p-values (in parentheses) from a Wilcoxon signed-ranks test between subsamples partitioned on stated reasons and their control firms are presented below.

Variables	Reduction in Operations		Improved Efficiency		Others	
Output	95.73	(0.0001)	279.04	(0.0002)	142.45	(0.0001)
Total Assets	5.25	(0.0001)	250.85	(0.0001)	32.77	(0.0001)
Debt to Equity	0.08	(0.7619)	-0.02	(0.2089)	-0.07	(0.4815)
ROE (%)	-4.25	(0.0036)	-1.85	(0.4415)	-6.60	(0.0098)
MKBKE	-0.27	(0.0001)	-0.38	(0.0026)	-0.16	(0.0570)
Op Income to Sales (%)	-3.47	(0.0001)	-0.01	(0.5835)	-1.75	(0.0175)
Output per Employee	3.84	(0.0398)	8.07	(0.6842)	7.36	(0.1158)

^c All monetary variables are in millions and employee figures are in thousands.

^d T-test is used to compare the mean values and the Wilcoxon signed rank test is used to compare the median values of reduction in operations and improved efficiency subsamples.

^e Mean and median beta on announcements are calculated from the market model with returns from the size-adjusted index as the market returns and day -291 to day -91 as the estimation period.

^f In addition to reporting mean and median values of subsamples, median values on differences and p-values (in parentheses) from a Wilcoxon signed-ranks test between subsamples partitioned on changes in output and their control firms are presented below.

Variables	Reduction in Operations		Improved Efficiency		Others	
Output	38.92	(0.0005)	128.76	(0.0001)	408.11	(0.0001)
Total Assets	0.36	(0.0048)	18.88	(0.0001)	160.03	(0.0001)
Debt to Equity	-0.07	(0.4172)	0.05	(0.9121)	-0.02	(0.5815)
ROE (%)	-9.50	(0.0007)	-2.60	(0.0482)	-1.10	(0.3526)
MKBKE	-0.26	(0.0280)	-0.37	(0.0001)	-0.22	(0.0358)
Op Income to Sales (%)	-3.47	(0.0001)	-2.61	(0.0001)	-1.50	(0.0198)
Output per Employee	-10.58	(0.2911)	11.49	(0.0006)	5.39	(0.0948)

Table 10. Percentage Changes in Employment Level for Sample and Control Firms Partitioned on Reasons for the Layoffs^{a,b}

Period	Sample		Control		Differences ^{c,d}			
	Mean	Median	Mean	Median	Mean	P-value	Mean	P-value
Panel A: Stratification by stated reasons								
Reduction in Operations (n=266)								
Year -1 to Year 0	-5.35%	-3.63%	3.77%	1.16%	-9.12%	(0.0001)	-4.97%	(0.0001)
Year 0 to Year +1	-4.85%	-3.18%	0.24%	-0.69%	-5.09%	(0.0012)	-2.40%	(0.0012)
Year +1 to Year +2	-3.08%	-3.50%	1.76%	-0.88%	-4.84%	(0.0098)	-3.15%	(0.0049)
Year 0 to Year +2	-7.19%	-7.12%	3.00%	-2.78%	-10.19%	(0.0004)	-5.64%	(0.0006)
Year -1 to Year +2	-11.42%	-11.45%	11.77%	-1.24%	-23.19%	(0.0004)	-10.03%	(0.0001)
Improved Efficiency (n=52)								
Year -1 to Year 0	1.36%	0.40%	4.75%	3.86%	-3.39%	(0.1700)	-3.31%	(0.0332)
Year 0 to Year +1	1.17%	-1.27%	5.11%	0.11%	-3.95%	(0.3145)	-2.56%	(0.1226)
Year +1 to Year +2	-0.68%	-0.47%	1.65%	0.44%	-2.33%	(0.2334)	-2.15%	(0.0639)
Year 0 to Year +2	0.86%	-2.07%	6.94%	-0.29%	-6.08%	(0.1384)	-3.33%	(0.1118)
Year -1 to Year +2	3.64%	-1.19%	13.47%	8.84%	-9.83%	(0.0564)	-12.83%	(0.0159)
Others (n=105)								
Year -1 to Year 0	-2.64%	-2.00%	14.61%	4.14%	-17.25%	(0.0231)	-8.38%	(0.0001)
Year 0 to Year +1	-2.74%	-2.85%	0.43%	1.01%	-3.18%	(0.1950)	-4.15%	(0.1043)
Year +1 to Year +2	-1.18%	-2.36%	1.44%	0.00%	-2.62%	(0.2306)	-4.07%	(0.0097)
Year 0 to Year +2	-2.96%	-5.42%	2.61%	0.70%	-5.68%	(0.1377)	-8.51%	(0.0704)
Year -1 to Year +2	-5.06%	-7.14%	18.05%	4.17%	-23.11%	(0.0060)	-14.71%	(0.0005)
Panel B: Stratification by Changes in Output								
Reduction in operations (n=110)								
Year -1 to Year 0	-14.39%	-10.49%	3.03%	1.91%	-17.42%	(0.0001)	-12.35%	(0.0001)
Year 0 to Year +1	-3.51%	-3.31%	-0.06%	-0.61%	-3.45%	(0.1477)	-2.59%	(0.0878)
Year +1 to Year +2	-3.16%	-2.57%	2.16%	0.96%	-3.16%	(0.0420)	-5.60%	(0.0075)
Year 0 to Year +2	-5.72%	-8.63%	3.08%	-1.66%	-8.80%	(0.0290)	-6.75%	(0.0041)
Year -1 to Year +2	-18.97%	-19.68%	10.05%	-0.95%	-29.02%	(0.0001)	-18.23%	(0.0001)
Improved efficiency (n=178)								
Year -1 to Year 0	2.77%	0.58%	11.93%	2.28%	-9.16%	(0.0654)	-0.28%	(0.1524)
Year 0 to Year +1	-3.60%	-2.43%	2.91%	0.11%	-6.51%	(0.0023)	-2.99%	(0.0008)
Year +1 to Year +2	-1.52%	-2.14%	1.35%	-0.53%	-2.87%	(0.1952)	-3.29%	(0.0209)
Year 0 to Year +2	-4.76%	-4.84%	5.39%	-0.59%	-10.15%	(0.0058)	-6.73%	(0.0061)
Year -1 to Year +2	-0.78%	-4.04%	23.34%	1.20%	-24.12%	(0.0156)	-7.81%	(0.0068)

Table 10. (Continued)

Period	Sample		Control		Differences ^{c,d}			
	Mean	Median	Mean	Median	Mean	P-value	Mean	P-value
Others (n=128)								
Year -1 to Year 0	-4.14%	-2.25%	2.03%	1.97%	-6.34%	(0.0002)	-4.97%	(0.0001)
Year 0 to Year +1	-4.21%	-3.20%	-1.93%	-0.44%	-3.01%	(0.1321)	-2.24%	(0.0992)
Year +1 to Year +2	-3.31%	-3.49%	1.39%	-1.57%	-4.70%	(0.0223)	-2.38%	(0.0495)
Year 0 to Year +2	-6.49%	-5.52%	0.51%	-1.40%	-7.00%	(0.0170)	-6.19%	(0.0846)
Year -1 to Year +2	-9.97%	-8.53%	2.71%	1.08%	-12.68%	(0.0002)	-10.28%	(0.0023)

^a Employment levels are obtained from Compustat. Changes in employment level are calculated by subtracting employment level in an earlier year (t-i) from that of the later year (t) and then divided by the employment level at year (t-i). P-values (in parenthesis) are based on a matched-pair with a t-test on means and a Wilcoxon signed-ranks test on medians.

^b Stratification is done by a) the reason stated in the layoff announcements or b) changes in output. Changes in output is computed by comparing output on announcement year and the previous year. Sample firms are classified into reduction in operations, improved efficiency, or others based on changes in output smaller than a negative 5 percents, greater than 5 percents, or within 5 percents.

^c Differences in employment level or changes in employment levels are calculated by subtracting values of the control from that of the sample.

^d A t-test on mean values and a Wilcoxon signed-ranks test on median values are used to assess statistical significance of differences in percentage.

As shown in Table 11, the performance of subsamples generally do not differ from their control firms in the period prior to the announcement year. This is similar to the results for the entire sample as shown in Table 5. When stratified according to the reasons stated for layoffs, the “reduction in operations subsample” has lower operating income to sales but higher sales to total assets and output per employee in the two-year period prior to the announcement year compared to its comparison firms, but the adjusted performance does not differ for the “improved efficiency subsample” and the “others subsample” in the prior period.

For the adjusted performance in the announcement year, considerable differences exist among the subsamples. For the firms in the “reduction in operations subsample”, the

adjusted performance is similar to that for the entire sample. The adjusted performance is significantly negative for most profitability measures, but positive for output per employee in the announcement year. Similarly, firms in the “others subsample” perform worse than their control firms in some profitability measures but better in output per employee. In the contrary, with the exception of market to book ratio of equity, firms in the “improved efficiency subsample” are not significantly different from their control firms.

As for the subsequent performance, adjusted profitability measures for the “improved efficiency subsample” and the “others subsample” differ from that of the “reduction in operations subsample” and the entire sample. Similar to the results for the entire sample, the firms in the “reduction in operations subsample” perform poorly relative to their control firms. On the other hand, the firms in the “improved efficiency subsample” appear to perform better than their control firms, while the firms in the “others subsample” perform similarly with their control firms in the subsequent period.

A different picture emerges when subsamples are formed according to changes in output. Unlike stratifying by reasons stated in layoff announcements, the adjusted performance of the “reduction in operations subsample” and the “improved efficiency subsample” is generally insignificant. Relative to the control firms, the change in performance of the “improved efficiency subsample” is positive for profit margin on sales, ROA, pretax income to sales and pretax income to total assets. The “others subsample” subsample” do not differ from each other. Specifically, adjusted profitability measures of subsamples appear to be similar to those of the entire sample, shown in Table 5. The “reduction in operations subsample” and the “improved efficiency subsample” perform

Table 11. Performance Measures of Sample Firms Adjusted for Performance of Control Firms Partitioned on the Reasons for the Layoffs^{a,b}

Adjusted Performance	Year -2	Year -1	Year 0	Year +1	Year +2
Panel A: Stratification by Stated Reason ^c					
<u>Reduction in Operations</u>					
Return on Assets (%)					
Mean	0.41%	-1.17%	-4.78% ***	-3.38% ***	-2.47% **
Median	-0.15%	-0.30%	-1.65% ***	-0.70% ***	-0.60% **
	(n=266)	(n=266)	(n=266)	(n=266)	(n=266)
Sales to Total Assets					
Mean	0.0794 *	0.0695 *	0.0633	0.0304	0.0305
Median	0.0510 **	0.0087 *	0.0136	0.0070	0.0094
	(n=266)	(n=266)	(n=266)	(n=266)	(n=266)
Market to Book Ratio of Equity					
Mean	0.4521	-0.5326	-0.3913 **	-0.4536	-1.5290
Median	0.0200	-0.0950	-0.2700 ***	-0.2400 ***	-0.2700 ***
	(n=234)	(n=238)	(n=233)	(n=232)	(n=229)
Operating Income to Sales (%)					
Mean	-3.25%	-5.15% **	-7.96% ***	-15.61%	-66.39%
Median	-1.29% ***	-2.09% ***	-3.47% ***	-1.96% ***	-1.79% ***
	(n=266)	(n=266)	(n=266)	(n=266)	(n=266)
Pretax Income to Sales (%)					
Mean	-1.26%	-3.31%	-7.81% **	-2.19%	-239.56%
Median	-0.86%	-1.00%	-3.49% ***	-1.71% ***	-2.15% ***
	(n=266)	(n=266)	(n=266)	(n=266)	(n=266)
Output per Employee					
Mean	20.736 *	7.579	0.424	32.737 *	35.480
Median	3.989	3.073 **	3.837 **	6.094 **	5.701 **
	(n=245)	(n=260)	(n=260)	(n=259)	(n=259)
<u>Improved Efficiency</u>					
Return on Assets (%)					
Mean	0.82%	1.03%	-1.39%	2.37% *	1.50%
Median	0.50%	0.45%	-0.45%	0.40% *	0.65% *
	(n=52)	(n=52)	(n=52)	(n=52)	(n=52)
Sales to Total Assets					
Mean	0.0549	0.0687	0.0676	0.0890	0.0981
Median	0.0328	0.0297	0.0486	0.0621	0.0806
	(n=52)	(n=52)	(n=52)	(n=52)	(n=52)
Market to Book Ratio of Equity					
Mean	-0.7370	-1.6491 *	-0.0384	-0.3747	-1.5218 **
Median	-0.2800	-0.2000 **	-0.3800 ***	-0.4200 **	-0.3500 **
	(n=46)	(n=47)	(n=45)	(n=45)	(n=45)
Operating Income to Sales (%)					
Mean	-0.06%	0.52%	-0.91%	1.07%	0.80%
Median	1.06%	0.58%	0.01%	1.25%	-0.40%
	(n=52)	(n=52)	(n=52)	(n=52)	(n=52)

Table 11. (Continued)

Adjusted Performance	Year -2	Year -1	Year 0	Year +1	Year +2
Pretax Income to Sales (%)					
Mean	0.08%	1.24%	-0.38%	5.71% *	3.67% **
Median	0.67%	1.74%	-0.06%	1.60% **	2.60% **
	(n=52)	(n=52)	(n=52)	(n=52)	(n=52)
Output per Employee					
Mean	10.153	45.633	164.220	22.323	44.069
Median	9.956	2.689	8.074	8.434	6.912
	(n=51)	(n=51)	(n=51)	(n=51)	(n=51)
Others					
Return on Assets (%)					
Mean	1.09%	1.22%	-1.84% *	-1.44%	-1.72%
Median	0.10%	-0.10%	-1.10% *	-0.60%	-0.70%
	(n=105)	(n=105)	(n=105)	(n=105)	(n=105)
Sales to Total Assets					
Mean	0.0605	0.0633	0.0023	-0.0266	-0.0183
Median	0.0015	0.0092	0.0012	-0.0081	-0.0058
	(n=105)	(n=105)	(n=105)	(n=105)	(n=105)
Market to Book Ratio of Equity					
Mean	-0.2065	-0.1685	-0.4727 **	-0.4886	1.3297
Median	0.0000	0.0000	-0.1600 *	0.1100	-0.1300
	(n=94)	(n=95)	(n=91)	(n=87)	(n=87)
Operating Income to Sales (%)					
Mean	0.41%	2.06%	1.01%	-0.65%	-0.20%
Median	-0.85%	-2.01% *	-1.75% **	-0.69% **	-1.17% *
	(n=105)	(n=105)	(n=105)	(n=105)	(n=105)
Pretax Income to Sales (%)					
Mean	0.93%	3.94%	2.16%	1.42%	-0.78%
Median	-0.83%	-1.16%	-2.11%	-1.25%	-1.17%
	(n=105)	(n=105)	(n=105)	(n=105)	(n=105)
Output per Employee					
Mean	3.060	0.084	2.305	2.213	-9.988
Median	10.951 *	9.860	7.359	6.974	5.501
	(n=94)	(n=100)	(n=100)	(n=100)	(n=100)

Table 11. (Continued)

Adjusted Performance	Year -2	Year -1	Year 0	Year +1	Year +2
Panel B: Stratification by Changes in Output ^d					
<u>Reduction in Operations</u>					
Return on Assets (%)					
Mean	-0.08%	-2.21%	-5.65% ***	-4.56% **	-5.69% **
Median	0.10%	-0.70%	-3.70% ***	-1.00% ***	-1.50% ***
	(n=110)	(n=110)	(n=110)	(n=110)	(n=110)
Sales to Total Assets					
Mean	0.0769	0.0897	-0.0285	-0.0061	0.0434
Median	0.0193 *	0.0380 *	0.0043	-0.0086	0.0132
	(n=110)	(n=110)	(n=110)	(n=110)	(n=110)
Market to Book Ratio of Equity					
Mean	0.5378	-0.5007 **	-0.3527	-1.1270	-2.8821
Median	0.0350	-0.1300	-0.2600 **	-0.1400 *	-0.0950
	(n=96)	(n=102)	(n=101)	(n=97)	(n=96)
Operating Income to Sales (%)					
Mean	-0.37%	-2.24%	-6.44%	-30.13%	-143.41%
Median	-0.87%	-2.43% **	-3.47% ***	-2.89% ***	-2.84% ***
	(n=110)	(n=110)	(n=110)	(n=110)	(n=110)
Pretax Income to Sales (%)					
Mean	-0.83%	-3.22%	-6.52% **	-36.14%	-567.08%
Median	0.83%	-1.13%	-6.11% ***	-1.63% *	-2.79% **
	(n=110)	(n=110)	(n=110)	(n=110)	(n=110)
Output per Employee					
Mean	22.913	-6.153	-28.618	36.494	50.513
Median	-0.465	4.579	-10.581	5.890	-7.442
	(n=102)	(n=110)	(n=110)	(n=110)	(n=110)
<u>Improved Efficiency</u>					
Return on Assets (%)					
Mean	1.69% *	0.57%	-3.70% ***	-1.40%	-1.94%
Median	-0.10%	-0.10%	-0.85% ***	-0.60%	-0.80%
	(n=178)	(n=178)	(n=178)	(n=178)	(n=178)
Sales to Total Assets					
Mean	-0.0072	-0.0285	0.0132	-0.0147	-0.0149
Median	0.0015	0.0009	0.0039	0.0002	-0.0055
	(n=178)	(n=178)	(n=178)	(n=178)	(n=178)
Market to Book Ratio of Equity					
Mean	-0.5498 *	-0.5853 *	-0.8468 ***	-1.1836	-0.0389
Median	-0.1250	-0.2000 **	-0.3700 ***	-0.3800 ***	-0.4900 ***
	(n=160)	(n=159)	(n=153)	(n=152)	(n=152)
Operating Income to Sales (%)					
Mean	-2.36%	-0.91%	-4.60% ***	-2.53%	-10.40%
Median	-0.79%	-1.57% **	-2.61% ***	-1.09% ***	-1.34% ***
	(n=178)	(n=178)	(n=178)	(n=178)	(n=178)

Table 11. (Continued)

Adjusted Performance	Year -2	Year -1	Year 0	Year +1	Year +2
Pretax Income to Sales (%)					
Mean	-0.17%	1.61%	-4.38% **	-1.24%	-10.79%
Median	-0.25%	-0.22%	-1.83% ***	-1.11%	-1.76% **
	(n=178)	(n=178)	(n=178)	(n=178)	(n=178)
Output per Employee					
Mean	20.075 **	27.120	64.310	29.382 **	26.607 *
Median	10.139 ***	3.904	11.485 ***	10.047 ***	10.738 ***
	(n=164)	(n=175)	(n=175)	(n=175)	(n=175)
Others					
Return on Assets (%)					
Mean	-0.36%	-0.05%	-1.91% *	-1.43%	1.50%
Median	0.00%	0.60%	-0.80% *	0.05%	0.40%
	(n=128)	(n=128)	(n=128)	(n=128)	(n=128)
Sales to Total Assets					
Mean	0.1689 ***	0.1786 ***	0.1601 ***	0.0948 *	0.0626
Median	0.1199 ***	0.1132 ***	0.1011 ***	0.0583 **	0.0603 *
	(n=128)	(n=128)	(n=128)	(n=128)	(n=128)
Market to Book Ratio of Equity					
Mean	0.7499	-0.6925	0.2595	-0.2702	-0.2546
Median	0.1100	0.0750	-0.2200 **	-0.1300 *	-0.0800
	(n=111)	(n=112)	(n=108)	(n=108)	(n=106)
Operating Income to Sales (%)					
Mean	-3.00%	-5.40%	-3.55% ***	-2.87%	0.10%
Median	-1.15% **	-1.11%	-1.50% **	-0.69% *	-0.35%
	(n=128)	(n=128)	(n=128)	(n=128)	(n=128)
Pretax Income to Sales (%)					
Mean	-1.07%	-2.86%	-2.28%	-9.19%	5.16%
Median	-1.80% *	-0.94%	-1.85% *	-0.84%	-0.02%
	(n=128)	(n=128)	(n=128)	(n=128)	(n=128)

Table 11. (Continued)

Adjusted Performance	Year -2	Year -1	Year 0	Year +1	Year +2
Output per Employee					
Mean	2.512	1.880	4.839	4.422	1.259
Median	2.677	4.907	5.391 *	4.987	4.540
	(n=124)	(n=126)	(n=126)	(n=126)	(n=126)

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

^a Stratification is done by a) reasons stated in the layoff announcements or b) changes in output. Sample firms are classified into reduction in operations, improved efficiency or others based on changes in output in year 0 relative to year -1 are smaller than negative 5%, greater than 5%, or within 5%.

^b De Meuse, Vanderheiden and Bergmann examine performance of the sample firms relative to the control firms and find sample firms perform worse than their comparison firms in the announcement year and in the following two years in four of the five performance measures.

^c A Wilcoxon signed-ranks test is used to compare the adjusted performance between the "reduction in operations subsample" and the "improved efficiency subsample" partitioned on reasons stated, and p-values are reported below:

<u>Adjusted Performance</u>	<u>Year -2</u>	<u>Year -1</u>	<u>Year 0</u>	<u>Year +1</u>	<u>Year +2</u>
Return on Assets	(0.4821)	(0.1742)	(0.1447)	(0.0082)	(0.0167)
Sales to Total Assets	(0.8914)	(0.8684)	(0.8438)	(0.4891)	(0.3596)
Market to Book Ratio of Equity	(0.1115)	(0.1379)	(0.1632)	(0.2067)	(0.3507)
Operating Income to Sales	(0.1857)	(0.0395)	(0.0246)	(0.0152)	(0.0294)
Pretax Income to Sales	(0.7786)	(0.1341)	(0.0767)	(0.0025)	(0.0010)
Output per Employee	(0.5761)	(0.7187)	(0.7366)	(0.8831)	(0.8818)

^d A Wilcoxon signed-ranks test is used to compare the adjusted performance between the "reduction in operations subsample" and the "improved efficiency subsample" partitioned on changes in output, and p-values are reported below:

<u>Adjusted Performance</u>	<u>Year -2</u>	<u>Year -1</u>	<u>Year 0</u>	<u>Year +1</u>	<u>Year +2</u>
Return on Assets	(0.9774)	(0.6910)	(0.0160)	(0.1363)	(0.1486)
Sales to Total Assets	(0.1309)	(0.0350)	(0.8710)	(0.8641)	(0.4372)
Market to Book Ratio of Equity	(0.3358)	(0.8120)	(0.1746)	(0.5698)	(0.0435)
Operating Income to Sales	(0.8017)	(0.5118)	(0.4102)	(0.3398)	(0.3803)
Pretax Income to Sales	(0.9530)	(0.2776)	(0.1275)	(0.3866)	(0.6808)
Output per Employee	(0.3621)	(0.9370)	(0.0022)	(0.1920)	(0.0365)

more poorly than their control firms in the announcement year on most of the profitability measures. Also, with the exception of the “others subsample”, subsequent profitability measures of all subsamples tend to be negative and are significant for some measures.

Figures 3 and 4 demonstrate in graphical form the median values of selected performance measures for subsamples formed according to both stratification schemes, which are the reasons stated in layoff announcements and changes in output. Performance measures of the sample firms in the subsamples and their comparison firms show similar trends over the 5-year period. For subsamples formed according to the reasons stated for layoffs, profitability measures of the “reduction in operations subsample” exhibit declining trends as the entire sample illustrated in Figure 2. The “improved efficiency subsample” is not associated with a declining trends, compared with the comparison firms or with the “reduction in operations subsample”. However, when sample firms are stratified according to changes in output, the difference between the “reduction in operations subsample” and the “improved efficiency subsample” is not apparent.

Table 12 presents the percentage changes in the profitability measures. Changes in performance differ among subsamples when sample firms are partitioned on reasons stated in layoff announcements. Despite an improvement in subsequent productivity, the subsequent performance of the “reduction in operations subsample” is worse than its prior period for most of the profitability measures. Relative to control firms, the change in performance of the “reduction in operations subsample” is negative for ROA, and ROE but positive for output per employee. Conversely, with the exception of an improvement in productivity measures, the change in performance of the “improved efficiency

subsample” is generally insignificant. Relative to the control firms, the change in performance of the “improved efficiency subsample” is positive for profit margin on sales, ROA, pretax income to sales and pretax income to total assets. The “others subsample” performs poorly in the subsequent period compared to its previous period, and this change in performance is negative for sales to total assets and pretax income to total assets relative to the control firms. The above finding in profitability is consistent with that in Table 11 and in Figure 3 and Figure 4. On the other hand, the change in performance of subsamples is similar when sample firms are partitioned by changes in output. Subsamples perform poorly in their subsequent period compared to their previous period, but tend to be statistically insignificant after adjusting the change in performance of the control firms.

Stratification by reasons stated in layoff announcements produce more heterogeneous subsamples relative to stratification by changes in output. The “reduction in operations subsample” and the “improved efficiency subsample” appear to have different changes in performance when subsamples are formed according to reasons stated in layoff announcements. The differences in adjusted changes in performance between groups generally decline when subsamples are formed according to changes in output. Results from a Wilcoxon signed-ranks test on adjusted performance for each year over the 5-year period and on adjusted percentage changes in performance over the period year -1 to year +2 between the “reduction in operations subsample” and the “improved efficiency subsample” provide partial support for the above claim.³⁹

³⁹ Results on adjusted performance for each year over the 5-year period are reported in footnotes 3 and 4 of Table 11. Results on adjusted percentage change over the period year -1 to year +2 are reported in footnote 4 of Table 12.

Reduction in Operations Subsample

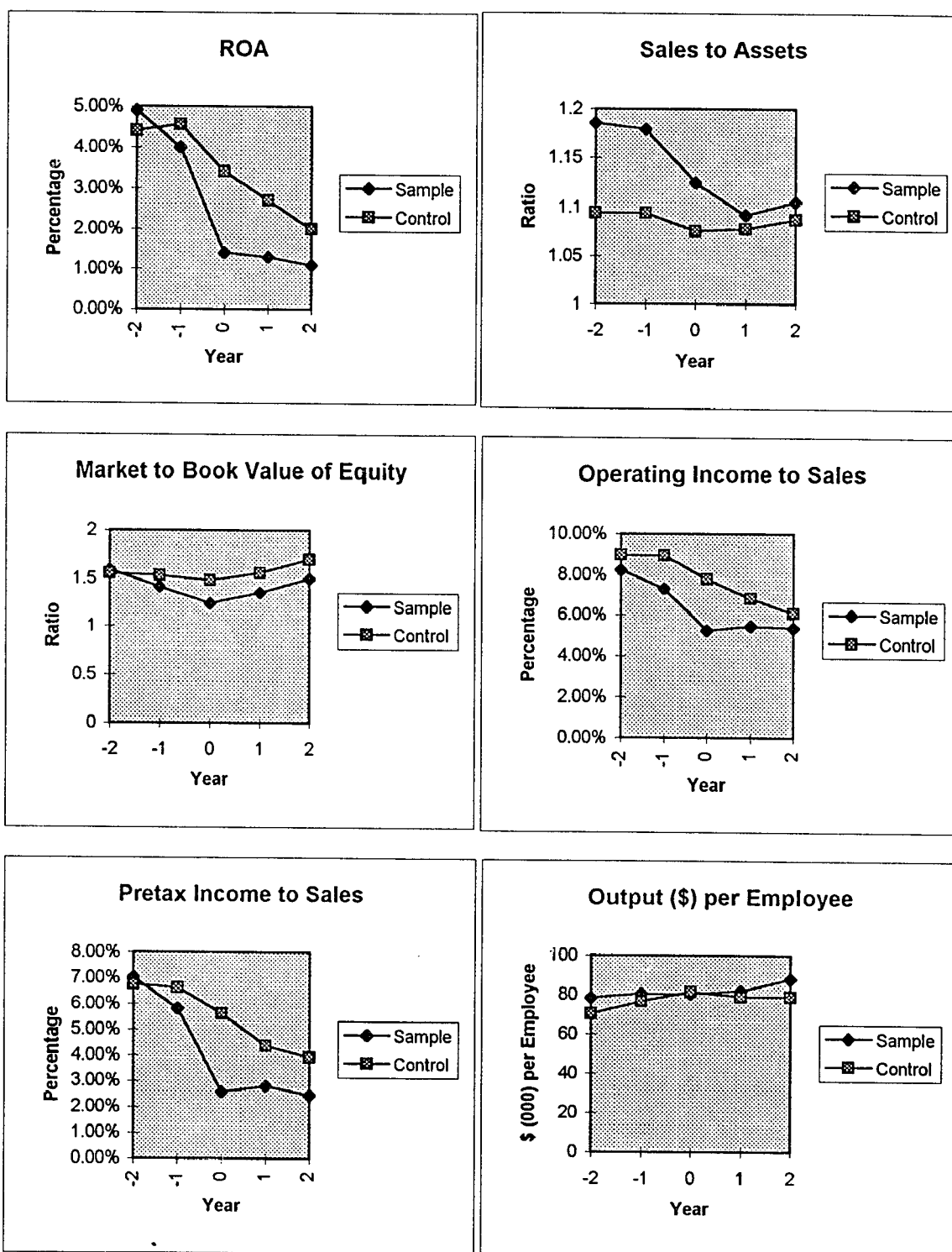


Figure 3. Median Values on Selected Variables for Subsamples Formed According to the Stated Reasons for Layoffs

Improved Efficiency Subsample

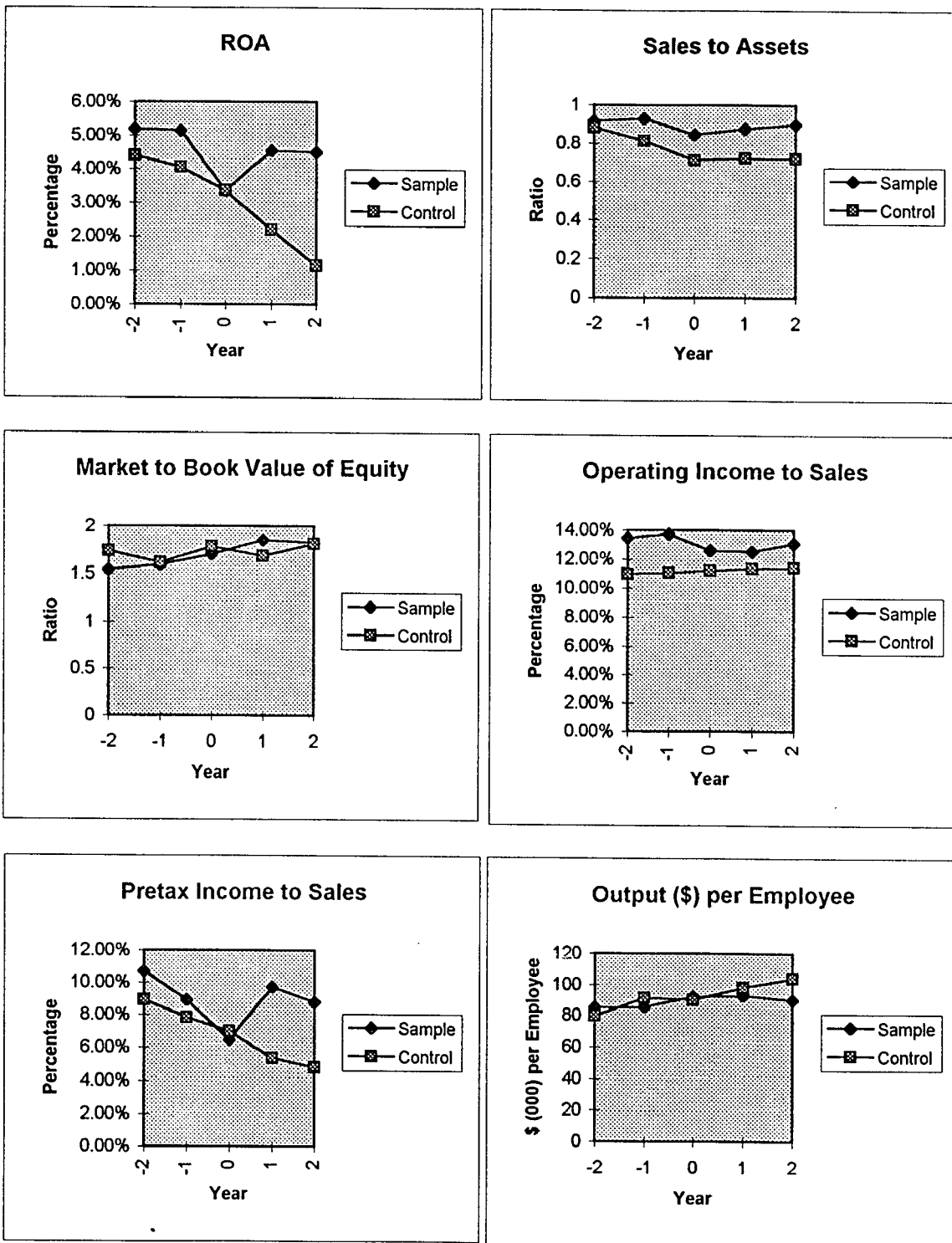


Figure 3. (Continued)

Others Subsample

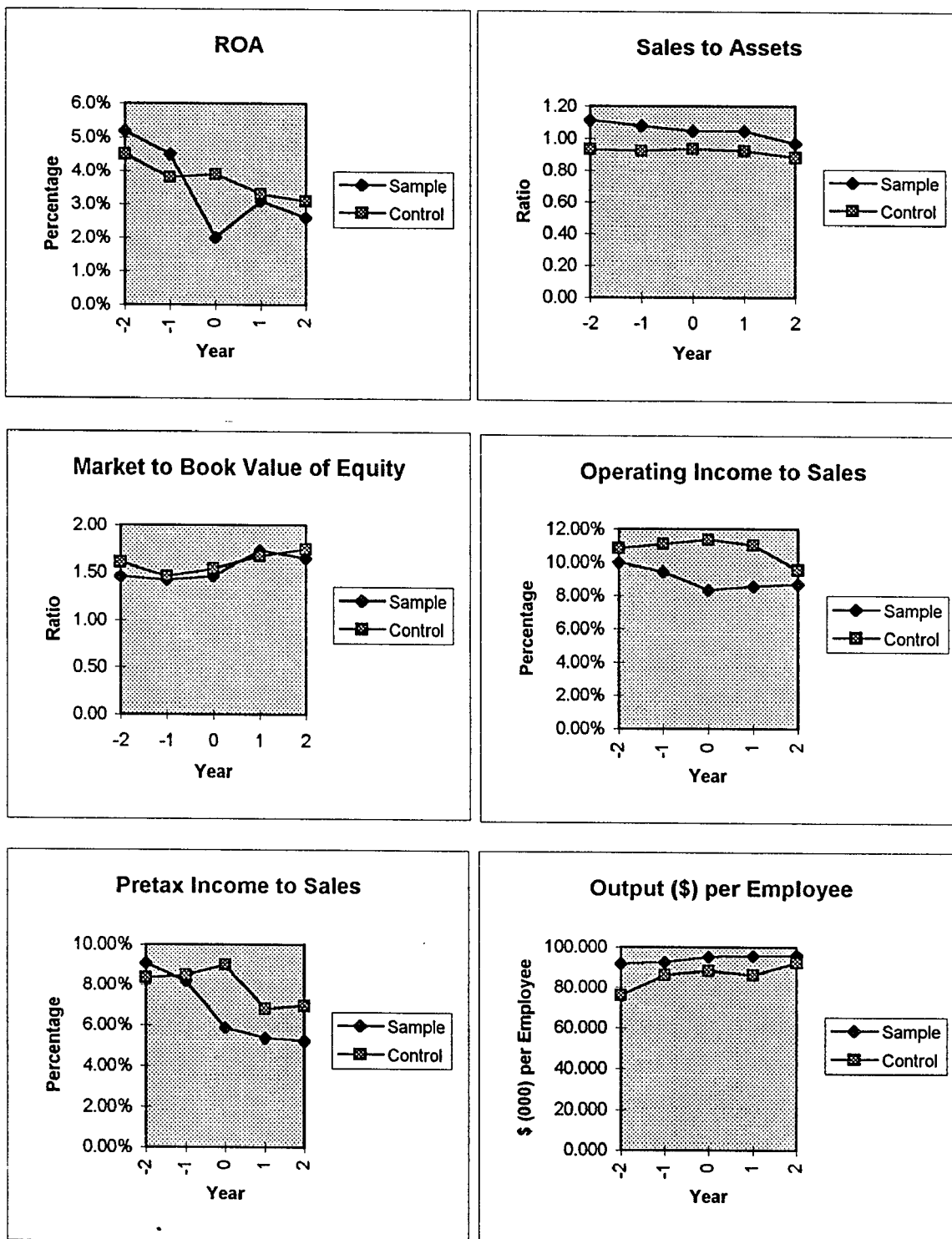


Figure 3. (Continued)

Reduction in Operations Subsample

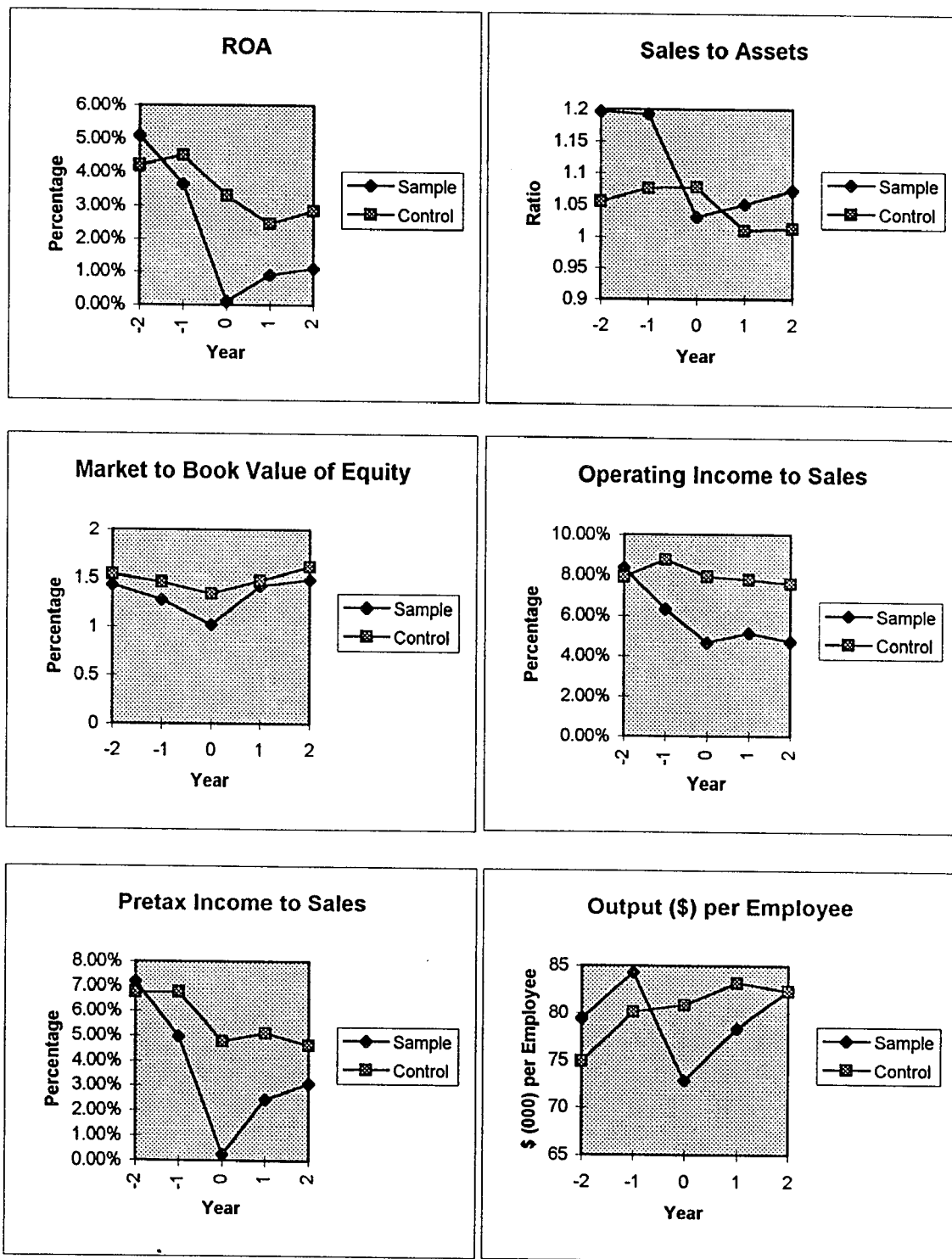


Figure 4. Median Values on Selected Variables for Subsamples Formed According to Changes in Output

Improved Efficiency

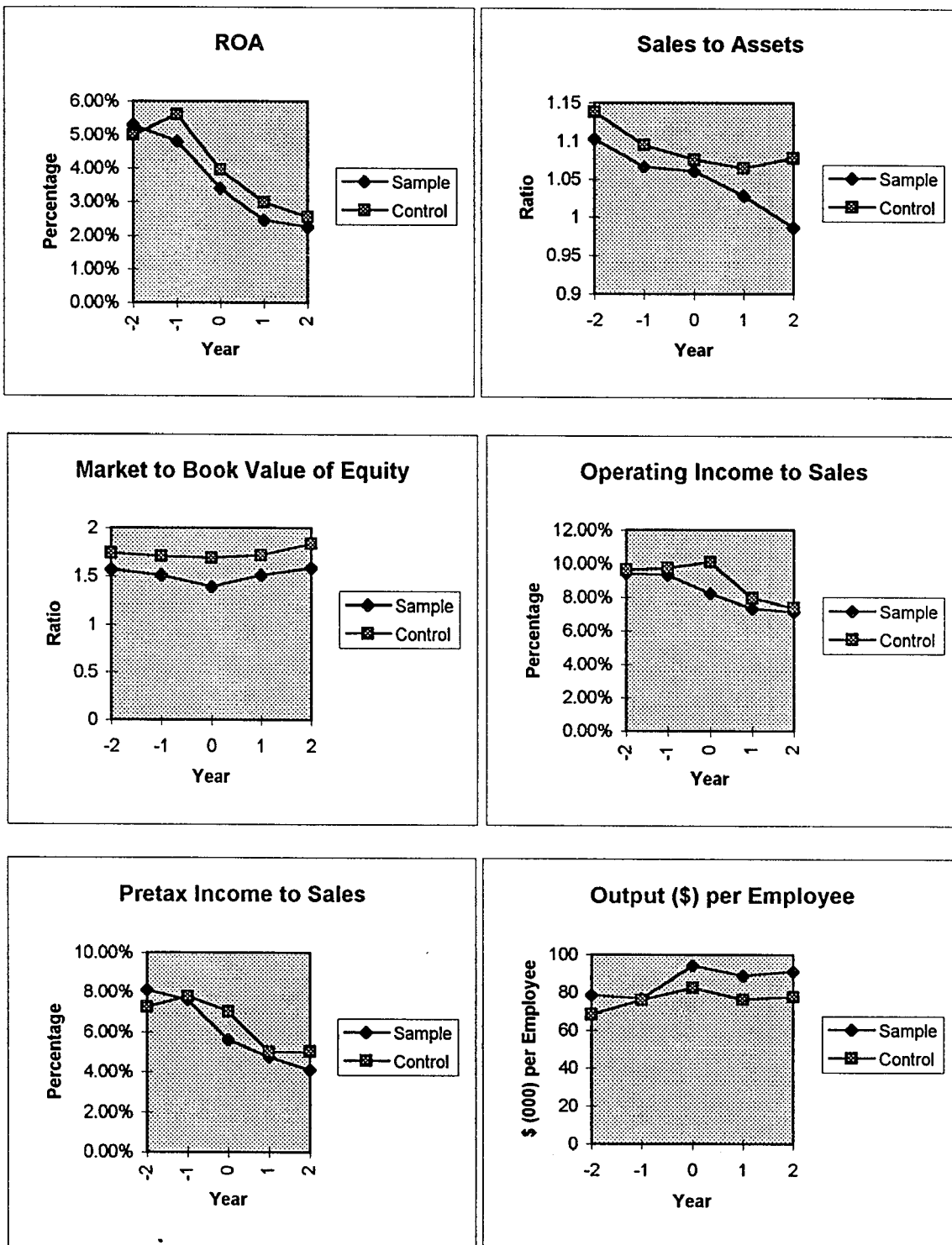


Figure 4. (Continued)

Others Subsample

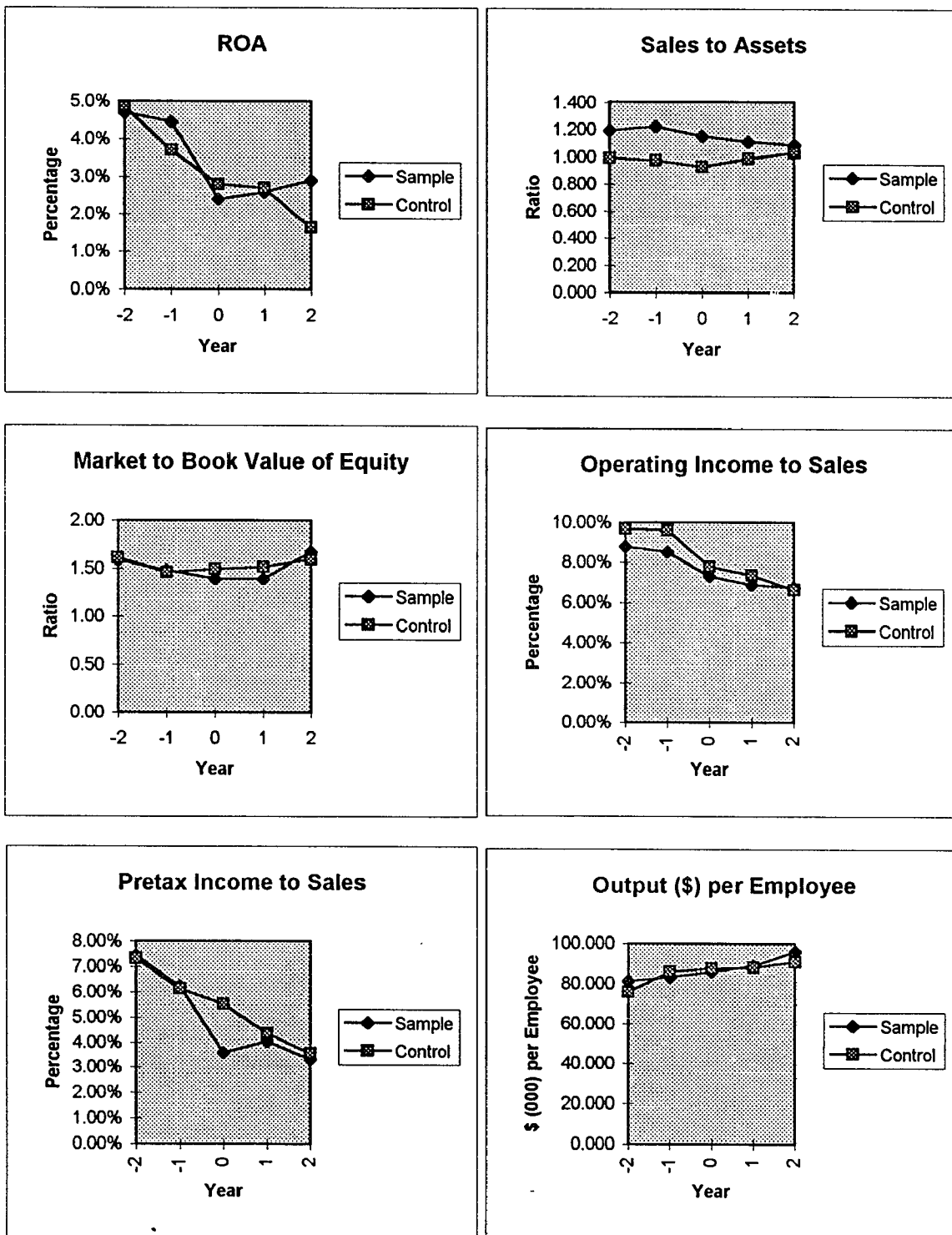


Figure 4. (Continued)

Table 12. Percentage Changes in Performance for the Sample Firms Subsequent to Layoff Announcements Partitioned on Reasons for the Layoffs^{a,b,c,d}

Performance Variable	Reduction in Operations		Improved Efficiency		Others	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Panel A: Stratification by Stated Reason						
Profit Margin on Sales						
Mean	-350.92	-271.43	37.74	154.13 **	-22.88	-13.08
Median	-37.96 ***	-7.35	-4.88	16.19 **	-16.02 ***	-12.27
	(n=266)	(n=266)	(n=52)	(n=52)	(n=105)	(n=105)
Return on Assets						
Mean	-353.27 **	-268.79 **	42.70	160.05 **	-43.21	-32.96
Median	-43.04 ***	-14.34 *	-9.73	3.68 *	-21.43 ***	-15.57
	(n=265)	(n=263)	(n=52)	(n=52)	(n=105)	(n=105)
Return on Equity						
Mean	-253.18	-334.03	-14.52	186.00	-4.47	-76.76
Median	-33.72 ***	-21.07 *	-8.35	-6.67	-13.38 *	-13.55
	(n=266)	(n=265)	(n=52)	(n=52)	(n=105)	(n=104)
Sales to Total Assets						
Mean	-0.82	-4.45 *	-1.07	-0.18	-5.75 **	-15.28 ***
Median	-5.02 ***	0.74	-3.25	2.47	-5.92 ***	-4.60 **
	(n=266)	(n=266)	(n=52)	(n=52)	(n=105)	(n=105)
Market to Book Ratio of Equity						
Mean	22.10 **	-71.03	4.72	-20.22	83.18	93.26
Median	0.00	-3.70	17.68 ***	0.14	9.54 ***	2.54
	(n=257)	(n=225)	(n=50)	(n=45)	(n=102)	(n=86)
Operating Income to Sales						
Mean	-9.05	26.9	17.60	6.21	530.24 *	522.85 *
Median	-18.72 ***	-5.19	1.13	4.93	-8.03 *	-1.36
	(n=266)	(n=264)	(n=52)	(n=52)	(n=105)	(n=105)
Operating Income to Total Assets						
Mean	-1.77	27.80	18.92	12.74	562.88	547.2024
Median	-23.24 ***	-9.62	-1.40	8.13	-14.23 ***	-3.2979
	(n=266)	(n=264)	(n=52)	(n=51)	(n=105)	(n=105)
Pretax Income to Sales						
Mean	-281.64	-231.87	91.16	95.60	64.88	71.99
Median	-33.35 ***	-7.94	-0.05	10.59 *	-17.01 ***	-9.81
	(n=266)	(n=266)	(n=52)	(n=52)	(n=105)	(n=105)
Pretax Income to Total Assets						
Mean	-163.92 ***	-115.18 *	107.43	87.46	51.65	61.58
Median	-42.37 ***	-13.24	-11.61	4.08 *	-24.85 ***	-14.94 *
	(n=266)	(n=266)	(n=52)	(n=52)	(n=105)	(n=105)
Sales per Employee						
Mean	17.59 ***	1.53	15.63 ***	3.05	15.27 ***	-4.87
Median	13.02 ***	0.78	14.36 ***	-1.31	13.68 ***	-1.96
	(n=266)	(n=266)	(n=52)	(n=52)	(n=105)	(n=105)
Output per Employee						
Mean	20.81 ***	4.93	13.51 ***	3.75	13.18 ***	-49.89
Median	11.59 ***	3.65 **	9.94 ***	-3.31	10.55 ***	1.65
	(n=260)	(n=259)	(n=52)	(n=51)	(n=101)	(n=98)

Table 12. (Continued)

Performance Variable	Reduction in Operations		Improved Efficiency		Others	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Panel B: Stratification by Changes in Output						
Profit Margin on Sales						
Mean	-677.93 *	-628.18	-150.90 **	-70.05	59.08	124.69
Median	-31.17 ***	-8.23	-31.45 ***	-9.47	-14.59 ***	1.61
	(n=110)	(n=110)	(n=178)	(n=178)	(n=128)	(n=128)
Return on Assets						
Mean	-409.64 *	-385.46 *	-90.27 **	13.36	-274.82	-203.89
Median	-34.48 ***	-21.03 **	-38.68 ***	-13.62	-17.88 ***	2.71
	(n=110)	(n=110)	(n=178)	(n=176)	(n=128)	(n=128)
Return on Equity						
Mean	99.80	-66.46	480.71	426.97	-1289.78	-1228.04
Median	-23.41 **	-9.62	-28.60 ***	-19.21 *	-17.03 ***	-10.61
	(n=110)	(n=110)	(n=178)	(n=178)	(n=128)	(n=128)
Sales to Total Assets						
Mean	-3.42	-5.20 *	-0.14	-3.03	-3.22 *	-13.24 ***
Median	-6.26 **	-3.31 *	-4.42 **	1.56	-4.69 **	-0.11 **
	(n=110)	(n=110)	(n=178)	(n=178)	(n=128)	(n=128)
Market to Book Ratio of Equity						
Mean	23.27 ***	-166.73	45.83	32.14	30.82	19.50
Median	11.33 **	10.03 **	4.55	-7.50 *	5.71 **	-0.48
	(n=104)	(n=95)	(n=173)	(n=150)	(n=125)	(n=104)
Operating Income to Sales						
Mean	44.45	75.41	121.86	142.37	216.67	227.71
Median	-23.84 **	-13.27	-12.92 ***	1.03	-8.35 **	-1.00
	(n=110)	(n=110)	(n=178)	(n=177)	(n=128)	(n=127)
Operating Income to Total Assets						
Mean	120.42	134.45	260.34	277.04	2.00	13.86
Median	-26.48 ***	-14.30	-17.41 ***	-3.13	-13.93 ***	-5.72
	(n=110)	(n=110)	(n=178)	(n=177)	(n=128)	(n=127)
Pretax Income to Sales						
Mean	-537.47	-553.75	-105.55	-51.98	112.86	163.95
Median	-33.35 **	-20.64	-32.53 ***	-8.01	-14.55 **	8.53
	(n=110)	(n=110)	(n=178)	(n=178)	(n=128)	(n=128)
Pretax Income to Total Assets						
Mean	-88.55	-127.68	-44.84	12.63	-116.01 **	-60.79
Median	-35.69 ***	-22.85 *	-40.22 ***	-15.03	-19.09 ***	1.73
	(n=110)	(n=110)	(n=178)	(n=178)	(n=128)	(n=128)
Sales per Employee						
Mean	16.01 ***	1.84	18.60 ***	3.05	15.88 ***	-5.49
Median	11.39 ***	-1.82	15.64 ***	3.56 **	13.47 ***	-3.30
	(n=110)	(n=110)	(n=178)	(n=178)	(n=128)	(n=128)

Table 12. (Continued)

Performance Variable	Reduction in Operations		Improved Efficiency		Others	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Output per Employee						
Mean	10.03 ***	-45.02	28.04 ***	14.48 **	11.20 ***	-7.62 *
Median	8.14 ***	-4.86 **	16.29 ***	10.80 ***	9.42 ***	-1.33
	(n=110)	(n=110)	(n=175)	(n=172)	(n=128)	(n=126)

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

^a Stratification is done by a) reasons stated in layoff announcements or b) changes in output.

Differences in output between the announcement year and the previous year are computed, and sample firms are classified as reduction in operations, improved efficiency, or others based on changes smaller than a negative 5 percent, greater than 5 percent, or within 5 percent.

P-value (in parenthesis) is based on a t-test on means and a Wilcoxon signed-ranks test on medians for the null hypothesis that mean (median) percentage change in performance is greater than or equal to zero for the "reduction in operations subsample". For the "improved efficiency subsample", the null hypothesis is mean (median) percentage change in performance is less than or equal to zero.

^b Percentage change in unadjusted performance is computed based on performance of sample firms on year -1 and year +2.

^c Percentage change in adjusted performance is computed by calculating performance of sample firms between the period year -1 and year +2 adjusted for the change in performance of their comparison firms over the same period.

^d A Wilcoxon signed-ranks test is used to compare the percentage changes on adjusted performance between the "reduction in operations subsample" and the "improved efficiency subsample" and p-values are presented below:

Performance Variables	Stratification Method	
	Stated Reasons	Changes in Output
Profit Margin on Sales	(0.0397)	(0.7262)
Return on Assets	(0.0439)	(0.3110)
Return on Equity	(0.2183)	(0.9437)
Sales to Total Assets	(0.3727)	(0.2503)
Market to Book Ratio of Equity	(0.7490)	(0.0283)
Operating Income to Sales	(0.2634)	(0.4198)
Operating Income to Total Assets	(0.2031)	(0.4525)
Pretax Income to Sales	(0.0993)	(0.5597)
Pretax Income to Total Assets	(0.0943)	(0.4741)
Sales per Employee	(0.8489)	(0.0994)
Output per Employee	(0.3885)	(0.0004)

When partitioning sample firms on reasons stated in layoff announcements, the adjusted performance measures of the “improved efficiency subsample” appear to be better than the “reduction in operations subsample” and are statistically significant for ROA, operating income to sales and pretax income to sales in the subsequent period. Yet, the “reduction in operations subsample” and the “improved efficiency subsample” formed according to output do not differ statistically except in the announcement year. Findings on the adjusted percentage changes in performance are similar to that on adjusted performance stated above. The “improved efficiency subsample” has higher adjusted changes in profit margin on sales, ROA, ROE, pretax income to sales and pretax income to total assets than the “reduction in operations subsample” formed according to the stated reasons for layoffs. The “improved efficiency subsample” formed according to changes in output differs statistically from the “reduction in operations subsample” only in adjusted market to book ratio of equity and output per employee.

Overall, when sample firms are partitioned on reasons stated in layoff announcements, there is some evidence associating layoffs with changes in performance. In addition, the findings on stratification of sample firms differ from the findings on the entire sample. Particularly, I find that the unadjusted changes in profitability are generally negative for the “reduction in operations subsample”, which is consistent with H2a. However, I find only partial support for H2b stating a negative association between layoffs and changes in profitability after adjusting the change of the matching control firms. This partial support is evidenced by a more negative adjusted change for ROA and operating income to total assets. Although the subsample performs poorly in profitability, the

change in productivity is positive and statistically significant relative to its control firms. Contrary to the expectation in H3a, the subsequent profitability does not improve even though the subsequent productivity improves for firms in the “improved efficiency subsample” following the layoff. This is evidenced by statistically insignificant changes in profitability but significant positive changes in productivity. However, finding an improvement in productivity is consistent with the expectation of H3b. After adjusting the change in profitability of control firms, the subsample performs better in profit margin on sales, ROA, pretax income to sales and pretax income to total assets. The above finding provides some supporting evidence for H3c. However, the change in productivity of the subsample does not differ relative to its control firms, which is inconsistent with an improvement expected by H3d.

Sensitivity Analysis and Limitations

The lack of an observable improvement in profitability for the sample firms can be attributed to be a lag between the timing of the layoffs and effects of the layoffs on financial performance. Another possible explanation is measurement error in output. Third, it can be firms that announced layoffs but experience a reduction in workforce that is either insignificant or offset the layoffs by a larger magnitude of new hirings.

As discussed earlier, 2 years subsequent to the year of the first layoff announcement may not be adequate to capture fully the effects of workforce reduction. If this is the case, then it is unlikely to find any improvement in subsequent performance without extending the time period for the subsequent performance. However, there are

two potential problems of examining a longer time period. First, an increase in the years of the data requirement leads to a survivorship bias. If firms that perform poorly are dropped from the sample, then there will be a mechanical improvement in performance in sample firms compared to their prior performance. Second, firms are more likely to change their focus with a longer time period and so the change in the performance measure can be misleading.

Another possible explanation is that the stratification methods, particularly changes in output, do not identify correctly the reasons for layoffs. In this study, adding changes in inventory balances to cost of goods sold can be a very poor proxy for output and so for reasons for the layoffs. By including cost of goods sold in computing output, an increase in production costs can lead to an increase in output even if production units remain the same or decrease. Alternatively, literature on the buffer stock model of inventory behavior [Haltiwanger and Maccini (1988)] suggests that firms respond to declining demand by accumulating inventories. If this is the case, the “improved efficiency subsample” includes firms that are inefficient or facing a decline in demand. This may explain a lack of difference in subsequent performance between the “reduction in operations subsample” and the “improved efficiency subsample” formed according to changes in output.

Finally, the reduction in workforce can be either too small as to be insignificant or that it is offset by a larger magnitude of new hirings. This being the case, operating costs are not expected to be reduced and profitability is not expected to improve. In order to control for this possibility, earlier tests on subsamples stratified by reasons stated in layoff

announcements are repeated on two subsets of sample firms, sample firms with actual decline in workforce over the period year -1 to year +2 and sample firms with announced layoffs greater than 5% of employees in year -1.⁴⁰ Specifically, changes in employment level are computed by subtracting the number of employees at year -1 from the number of employees at year +2 and then dividing by the number of employees at year -1, and the percentage of layoffs announced are calculated by dividing the sum of the announced cutback in employees during the sample period by the number of employees at year -1.⁴¹ The resulting number of sample firms in the two subsets are: 287 firms with actual reduction in workforce subsequently and 206 firms with announced layoffs greater than 5% of the employment level in year -1.

Panel A of Table 13 reports the distribution of sample firms by changes in employment level and by the reasons stated for layoffs. Twenty-seven out of 52 sample firms (52%) citing improved efficiency actually reduce their employment level, while 194 out of 266 sample firms (73%) citing a reduction in operations and 66 out of 105 firms (63%) citing other reasons reduce their employment. The finding that a larger proportion of sample firms citing a reduction in operations reduces its workforce than those citing improved efficiency is consistent with the explanation that firms with poorer sales prospects are likely to reduce their workforce. The distribution of sample firms by

⁴⁰ Stratification on the two subsets of sample firms is also done according to changes in output. Subsamples perform more poorly in the subsequent period than their previous period. The change in performance is generally insignificant for subsamples after adjusting for the change in performance of the control firms.

⁴¹ Announcements of unspecified magnitude are dropped from the sample. Also, the smaller number is used when the layoff announcements state that a range of employees that could be affected.

Table 13. Breakdown of Sample Firms by Reasons for Layoffs and by Subsequent Change in Employment Level or by Percentage of Announced Cutbacks

	Entire Sample	Reduction in Operations	Improved Efficiency	Others
Panel A: Breakdown by Stated Reasons and by Subsequent Change in Employment Level ^a				
Change $\leq -25\%$	105	75	6	24
$-25\% < \text{Change} \leq -10\%$	95	65	9	21
$-10\% < \text{Change} < 0\%$	87	54	12	21
$0\% \leq \text{Change} < 5\%$	43	22	9	12
$5\% < \text{Change} \leq 20\%$	43	25	8	10
Change $> 20\%$	50	25	8	17
Total Number of Firms	423	266	52	105
Panel B: Breakdown by stated reasons and by percentage of announced cutbacks ^b				
Announced Cut-back $\leq 1\%$	60	25	12	23
Announced Cut-back $> 1\%$ and $\leq 2.5\%$	60	37	8	15
Announced Cut-back $> 2.5\%$ and $\leq 5\%$	53	35	8	10
Announced Cut-back $> 5\%$ and $\leq 7.5\%$	55	30	7	18
Announced Cut-back $> 7.5\%$ and $\leq 15\%$	90	61	12	17
Announced Cut-back $> 15\%$	61	51	2	8
Firms with Unspecified Layoffs	44	27	3	14
Total	423	266	52	105

^a Change in employment level is calculated over the period year -1 to year +2. For sample firms with subsequent decline in employment level, 194 firms are included in the “reduction in operations subsample”, 27 firms are included in the “improved efficiency subsample”, and 66 firms are included in the “others subsample”. Also, all subsamples have reductions in employees larger than their control firms during the period year -1 to year +2.

^b Percentage of announced cutbacks is calculated relative to year -1. For sample firms with announced cutbacks greater than 5 percent of the total number of employees at year -1, 142 firms are included in the “reduction in operations subsample”, 21 firms are included in the “improved efficiency subsample”, and 43 firms are included in the “others subsample”. All subsamples have larger reductions in employees relative to their control firms during the period year -1 to year +2, but the reduction is statistically insignificant for the “improved efficiency subsample”.

percentage of announced layoffs and by the stated reasons for layoffs is shown in Panel B of Table 13.

Earlier tests on subsamples from the entire sample are now performed on subsamples formed according to reasons stated in layoff announcements from the two subsets. Adjusted performance on selected performance measures each year over the 5-year period for both subsets of sample firms are shown in Table 14. For subsamples formed from both subsets, the results are similar to that from the entire sample reported in Table 11. With the exception of the “reduction in operations subsample” formed from the subset with subsequent decline in workforce, prior performance of subsamples is generally not different from their control firms. Similar to the finding on subsamples from the entire sample, the firms in the “reduction in operations subsample” report lower profitability measures but higher productivity measures than their control firms in the announcement year and in the subsequent two years. The “improved efficiency subsample” and the “others subsample” do not appear to perform consistently better or worse than their control firms over the above period.

Median values of selected performance measures for subsamples and the control firms are illustrated in Figures 5 and 6. Subsamples from the two subsets exhibit similar trends with subsamples from the entire sample as shown in Figure 3 and Figure 4. The “reduction in operations subsample” is associated with a downward trend over the 5-year period. Excluding profitability measures in the announcement year, the “improved efficiency subsample” is not associated with a declining trend.

Table 14. Performance Measures of Subsets of Sample Firms Adjusted for Performance of Control Firms Partitioned on Reasons for the Layoffs

Adjusted Performance ^{a,b}	Year -2	Year -1	Year 0	Year +1	Year +2
Panel A: Partitioned on Stated Reasons on a Subset with Subsequent Decline in Employees ^{c,e}					
<u>Reduction in Operations (n=194)</u>					
Return on Assets (%)	-0.50%	-0.85% **	-2.70% ***	-1.05% ***	-1.25% ***
Sales to Total Assets	0.0046	0.0065	0.0095	-0.0036	0.0059
Market to Book Ratio of Equity	0.0055	-0.0800 *	-0.2300 ***	-0.2200 ***	-0.2700 **
Operating Income to Sales (%)	-1.47% ***	-2.46% ***	-3.56% ***	-2.93% ***	-2.26% ***
Pretax Income to Sales (%)	-1.06%	-1.62% **	-5.14% ***	-2.46% ***	-2.98% ***
Output per Employee	-0.3519	0.6671	2.6771	4.9867	4.4714
<u>Improved Efficiency (n=27)</u>					
Return on Assets (%)	1.80%	2.50%	-0.30%	2.20% *	3.20% *
Sales to Total Assets	0.1096	0.1420	0.1090	0.1532	0.1625
Market to Book Ratio of Equity	-0.2800 *	-0.3100 *	-0.5050 ***	-0.5650 **	-0.3500 *
Operating Income to Sales (%)	2.10%	2.28%	1.27%	1.35%	0.94%
Pretax Income to Sales (%)	2.62%	2.80% **	1.16%	3.00% ***	7.88% ***
Output per Employee	12.969	3.5443	8.1816	8.2035	8.6042
<u>Others (n=66)</u>					
Return on Assets (%)	-0.05%	-0.20%	-1.70% **	-0.70% *	-0.20%
Sales to Total Assets	0.0508	0.1016 *	0.0109	0.0017	0.0185
Market to Book Ratio of Equity	-0.1100 *	-0.0700	-0.3350 **	-0.1500	-0.1250
Operating Income to Sales (%)	-1.01%	-2.69% **	-2.41% **	-3.41% ***	-1.61% **
Pretax Income to Sales (%)	-1.35%	-1.66%	-3.99%	-2.36% **	-0.84%
Output per Employee	13.2349	9.3105	1.1093	6.6548	-2.4089
Panel B: Partitioned on Stated Reasons on a Subset with Announced Cutbacks greater than 5% ^{d,e}					
<u>Reduction in Operations (n=142)</u>					
Return on Assets (%)	-0.05%	-0.30%	-3.65% ***	-1.70% **	-1.70% **
Sales to Total Assets	0.0468	-0.0013	-0.0024	-0.0362	-0.0163
Market to Book Ratio of Equity	0.0900	-0.1000	-0.3350 ***	-0.2850 *	-0.2900 **
Operating Income to Sales (%)	-0.83%	-1.89% *	-4.42% ***	-3.27% ***	-2.45% ***
Pretax Income to Sales (%)	-0.23%	-0.69%	-5.69% ***	-2.87% ***	-3.16% ***
Output per Employee	3.9886 **	4.7285	9.0505 ***	9.8696 ***	6.9256 ***
<u>Improved Efficiency (n=21)</u>					
Return on Assets (%)	1.90% *	4.80% ***	-0.30%	3.00% **	4.80% **
Sales to Total Assets	0.1063	0.1420	0.1502	0.0958	0.0995
Market to Book Ratio of Equity	-0.3350	-0.1700	-0.3850 **	-0.6250 **	-0.5250 *
Operating Income to Sales (%)	2.10%	0.77%	1.27%	1.35%	-0.96%
Pretax Income to Sales (%)	2.62%	4.81% **	0.27%	3.00% *	5.70% **
Output per Employee	11.7901	9.2753	8.9695	11.0892	17.9569

Table 14. (Continued)

Adjusted Performance ^{a,b}	Year -2	Year -1	Year 0	Year +1	Year +2
<u>Others (n=43)</u>					
Return on Assets (%)	0.10%	0.10%	-1.10%	-0.50%	-0.70%
Sales to Total Assets	0.0004	0.0080	0.0030	-0.0144	-0.0028
Market to Book Ratio of Equity	0.0800	-0.0100	-0.3400 *	-0.2100	-0.1300
Operating Income to Sales (%)	-1.88%	-2.99%	-1.59%	-0.18%	-1.59% **
Pretax Income to Sales (%)	-0.33%	-0.54%	-3.52%	-0.71%	-2.35%
Output per Employee	31.7951 **	22.8097 **	18.0002 *	6.839	26.338 **

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

^a Median values are reported and level of significant is evaluated using a Wilcoxon signed-ranks test.

^b Number of observations (n) for market to book ratio of equity and output per employee are smaller than the total number of sample firms and the number of available observations changes slightly each year. There are 54 fewer observations for market to book ratio of equity and 12 fewer observations for output per employee on year 0 for the entire sample 423 firms after adjusted for that of the control firms.

^c Changes in employment level is computed by subtracting the total number of employees in year -1 from the total number of employees in year +2 and then divided by employment level in year -1.

^d Percentage of announced layoffs is computed by dividing the total number of employees stated in layoff announcements by the total number of employees at year -1.

^e A Wilcoxon signed-ranks test is used to compare the adjusted performance between the "reduction in operations subsample" and the "improved efficiency subsample" for both subsets of sample firms, and p-values are presented below:

Subset of Sample Firms with Subsequent Decline in Employees					
Performance Variables	Year -2	Year -1	Year 0	Year +1	Year +2
Return on Assets	(0.1542)	(0.0443)	(0.0235)	(0.0031)	(0.0039)
Sales to Total Assets	(0.7195)	(0.7860)	(0.9271)	(0.4322)	(0.4532)
Market to Book Ratio of Equity	(0.0577)	(0.1482)	(0.0707)	(0.1172)	(0.2002)
Operating Income to Sales	(0.0328)	(0.0058)	(0.0165)	(0.0194)	(0.0154)
Pretax Income to Sales	(0.1030)	(0.0090)	(0.0198)	(0.0002)	(0.0002)
Output per Employee	(0.8058)	(0.8316)	(0.9225)	(0.8933)	(0.7467)
Subset of Sample Firms with Announced Layoffs greater than 5% of Employees at Year -1					
Performance Variables	Year -2	Year -1	Year 0	Year +1	Year +2
Return on Assets	(0.3141)	(0.0438)	(0.0459)	(0.0082)	(0.0090)
Sales to Total Assets	(0.7398)	(0.4011)	(0.3874)	(0.4989)	(0.4560)
Market to Book Ratio of Equity	(0.1771)	(0.4792)	(0.3462)	(0.1107)	(0.1879)
Operating Income to Sales	(0.9152)	(0.3820)	(0.2880)	(0.1379)	(0.1918)
Pretax Income to Sales	(0.6433)	(0.0266)	(0.1353)	(0.0090)	(0.0014)
Output per Employee	(0.5662)	(0.7844)	(0.9999)	(0.7537)	(0.6880)

Reduction in Operations Subsample

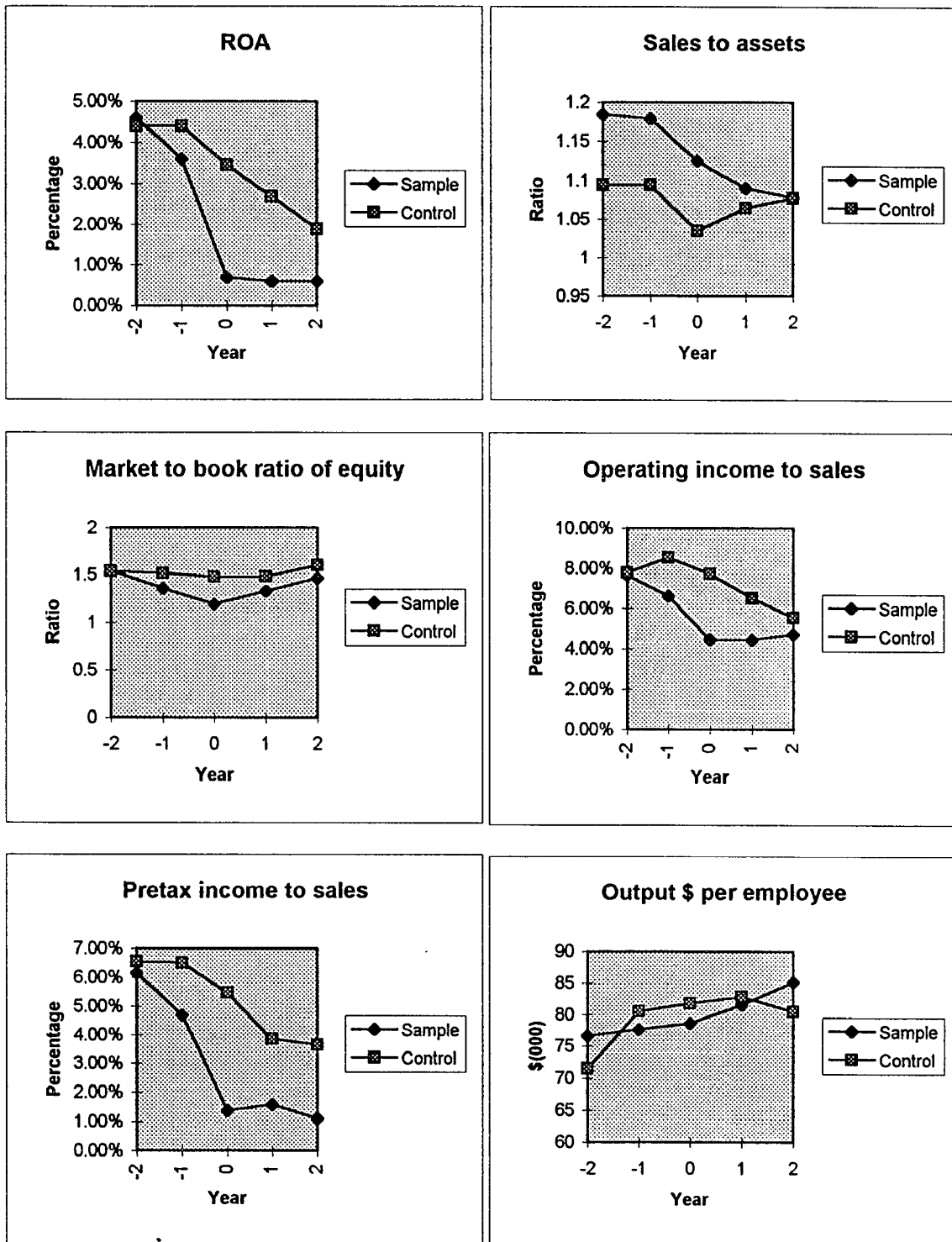


Figure 5. Median Values on Selected Variables for Subsample Formed According to Reasons for Layoffs on Firms with Subsequent Decline in Employment Level

Improved Efficiency Subsample

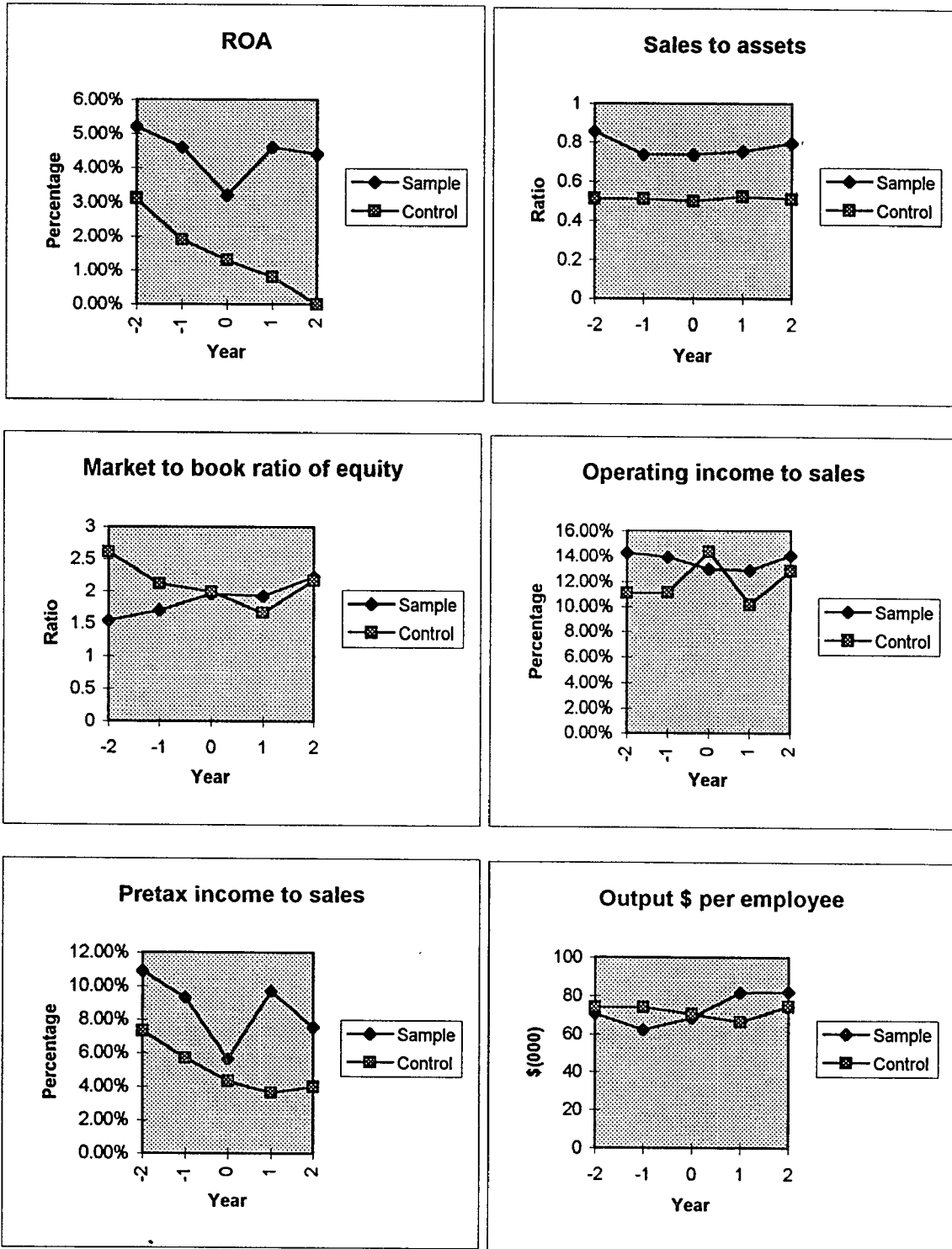


Figure 5. (Continued)

Others Subsample

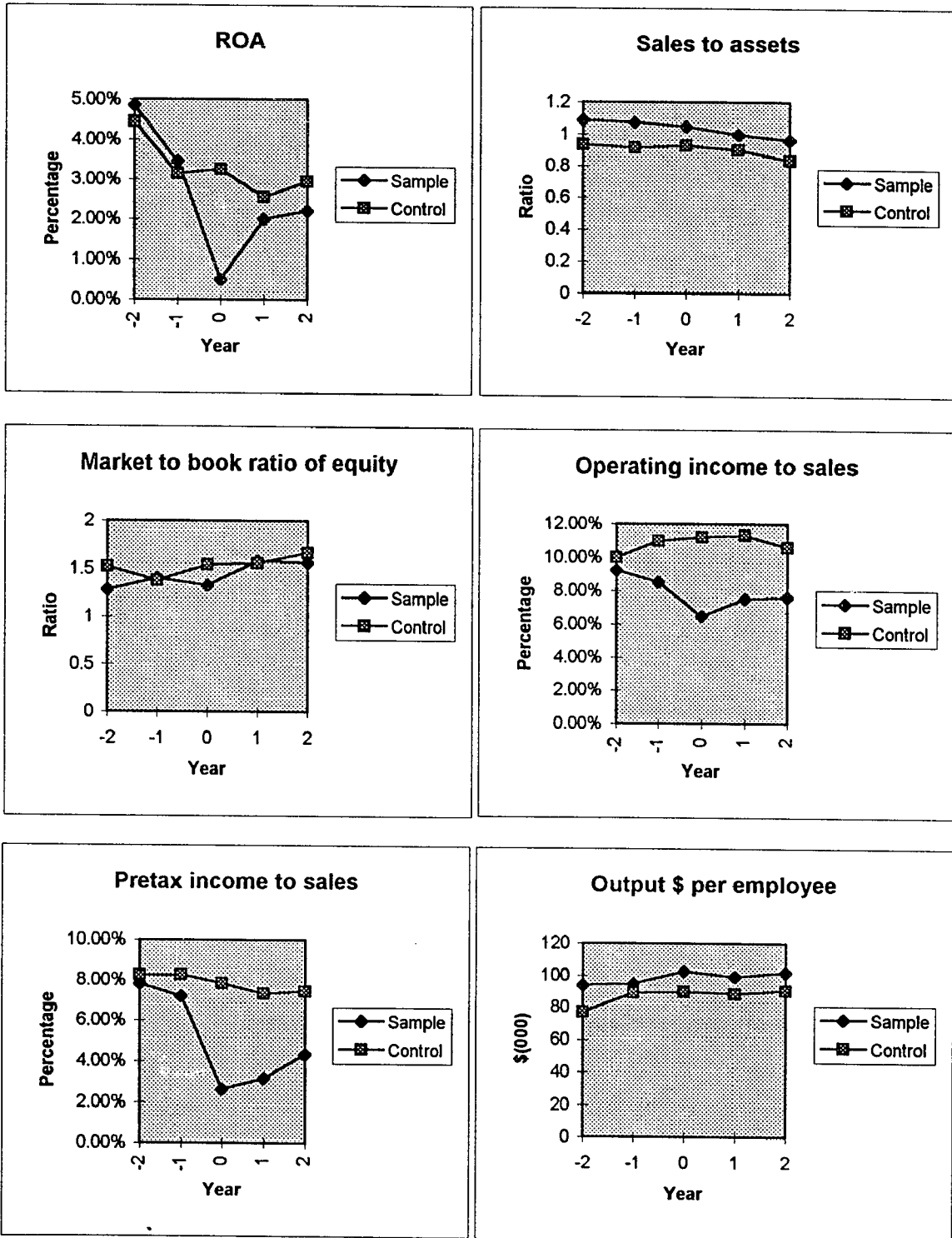


Figure 5. (Continued)

Reduction in Operations Subsample

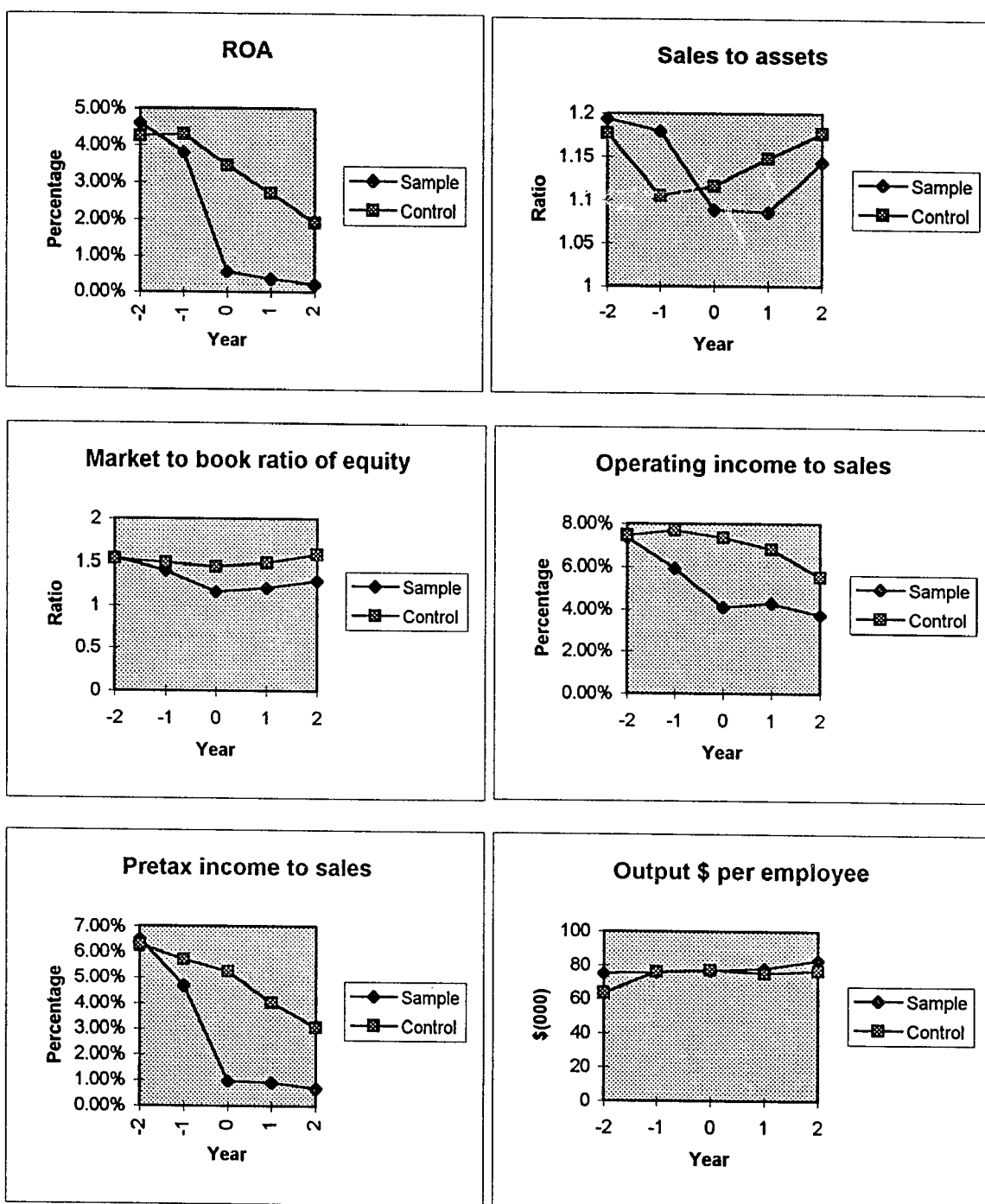


Figure 6. Median Values on Selected Variables for Subsamples Formed According to Reasons Stated for Layoffs on Firms with Percentage of Announced Layoffs greater than 5 Percent of Employment Level in Year -1

Improved Efficiency Subsample

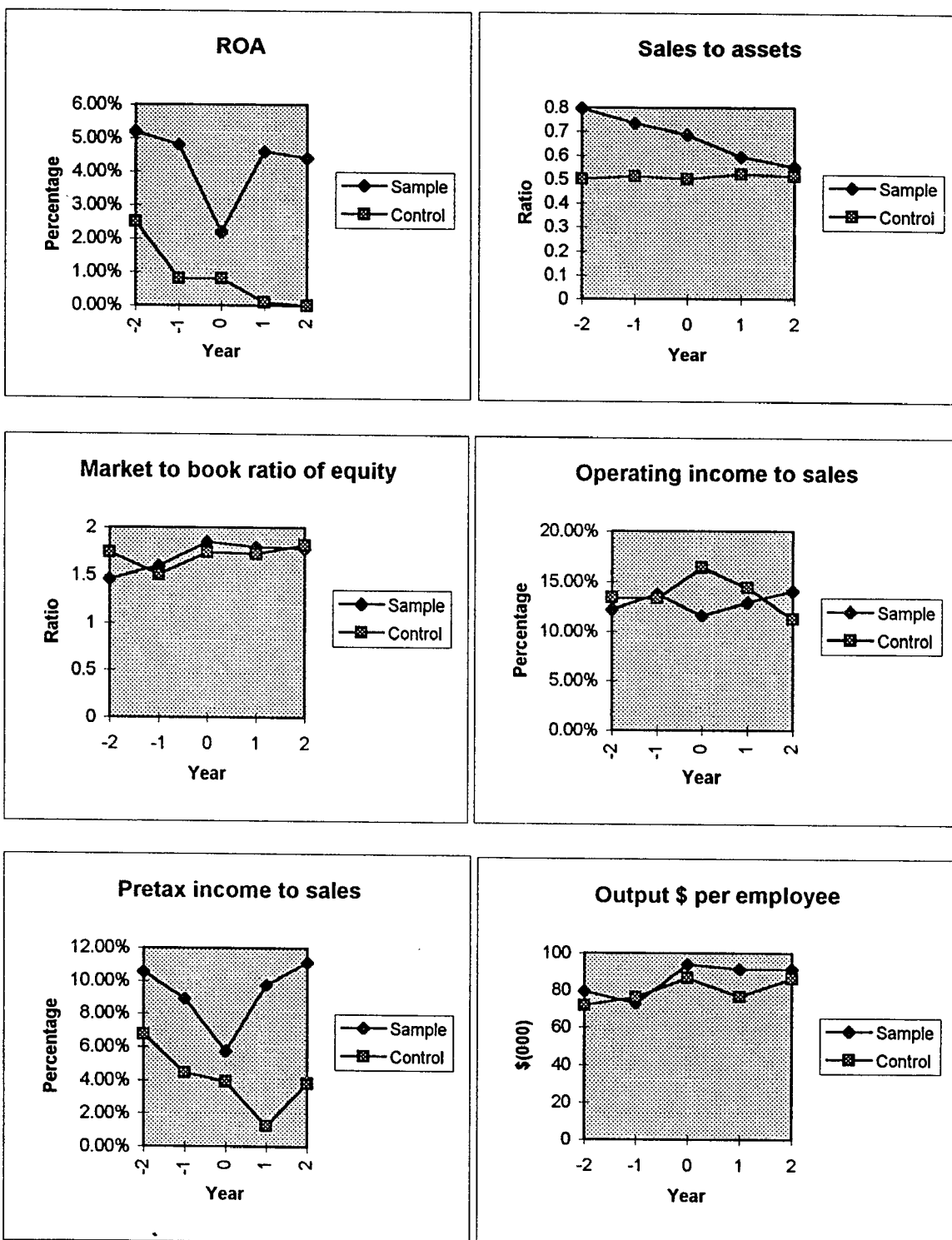


Figure 6. (Continued)

Others Subsample

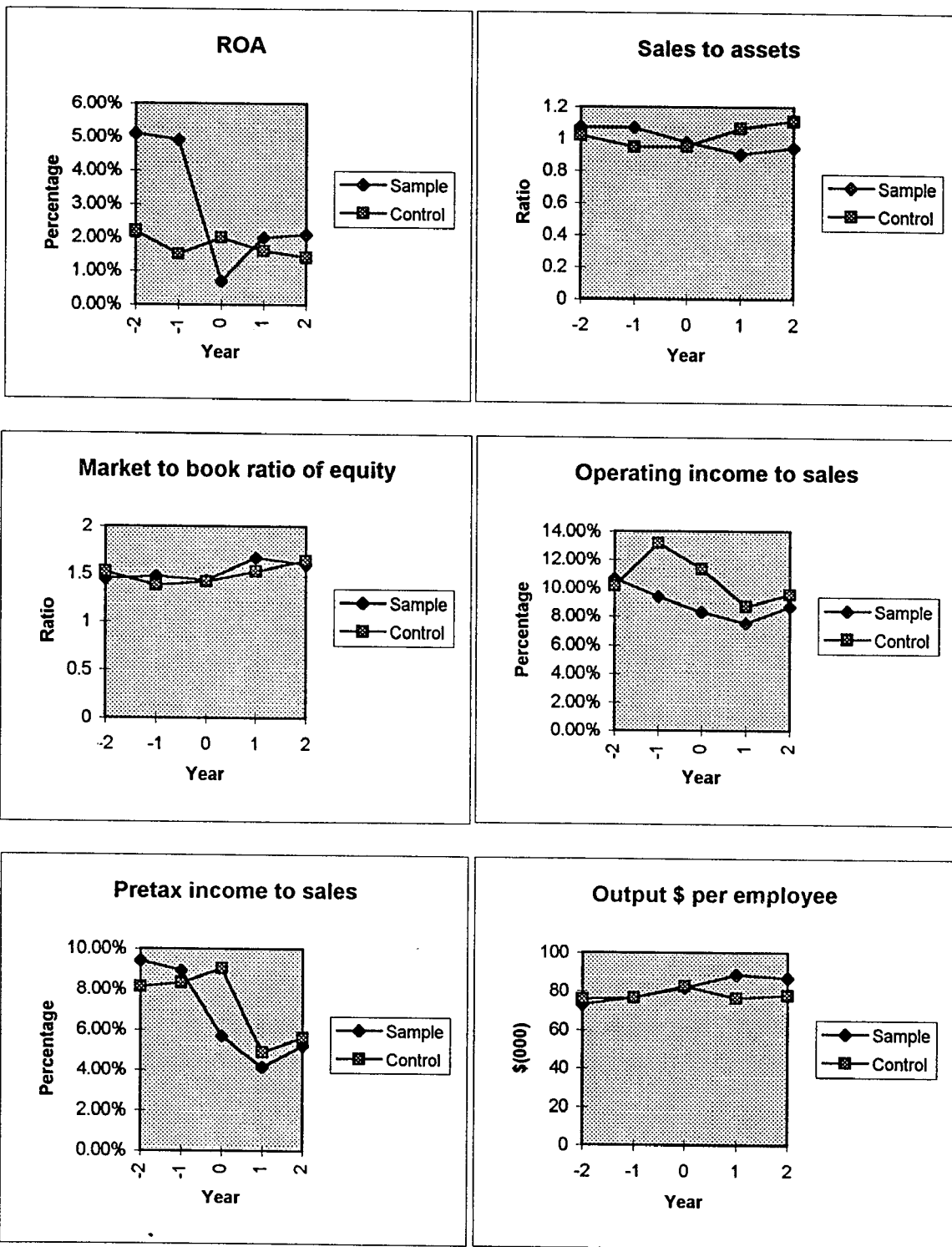


Figure 6. (Continued)

The Unadjusted and adjusted percentage changes in performance on subsamples from two subsets are reported in Table 15 and the findings are similar to that on subsamples from the entire sample. The “reduction in operations subsample” appears to perform more poorly in the subsequent period than in the prior period. For the subset with subsequent decline in employees, the deterioration in profitability is statistically significant in ROA, ROE and operating income to total assets relative to its comparison firms. For the subset with announced layoffs greater than 5% of employees at year -1, the deterioration in profitability is statistically significant in ROA and ROE. For the subset with subsequent decline in employees, the unadjusted change in profitability for the “improved efficiency subsample” is negative in profit margin on sales, ROA, ROE, pretax income to sales and pretax income to total assets, but positive in market to book ratio of equity. The change in profitability is positive for profit margin on sales and ROA relative to the control firms. For the firms in the “improved efficiency subsample” that have announced layoffs greater than 5% of employees at year -1, the change in profitability is not statistically significant. However, the change in profit margin on sales, ROA, and operating income to sales is significantly greater for the sample firms than their matching control firms. The change in sales to total assets is significantly lower than the control firms.

In general, findings on subsamples formed from subsets of sample firms are similar to the subsamples formed from the entire sample.⁴² Restricting the test to subsets of

⁴² Similar results are obtained when subsamples are formed according to the stated reasons for layoffs of firms with changes in subsequent employment level within -25% and +20. Results are generally similar when the sample include 254 firms with only one layoff announcements during the sample period or 622 firms with layoff announcements in different years treated independently.

Table 15. Percentage Changes on Subsequent Performance of Subsets of Sample Firms Partitioned on Reasons for the Layoffs^{a,b}

Performance Variables	Reduction in Operations		Improved Efficiency		Others	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Panel A: Partitioned on Stated Reasons on a Subset with Subsequent Decline in Employment Level ^{c,c}						
	(n=194)		(n=27)		(n=66)	
Profit Margin on Sales	-48.97 ***	-5.78	-13.78 *	24.49 **	-10.55 *	-7.83
Return on Assets	-56.52 ***	-16.99 *	-18.46 **	10.42 *	-16.82 *	-8.34
Return on Equity	-41.62 ***	-21.64 *	-9.56 **	2.63	-9.20	-6.08
Sales to Total Assets	-6.35 ***	0.74	1.50	3.04	-6.12 **	-4.19 *
Market to Book Ratio of Equity	-1.83	-2.41	15.92 **	-1.30	16.67 ***	11.60 **
Operating Income to Sales	-21.33 ***	-8.63	-3.72	1.95	-8.24	0.01
Operating Income to Total Assets	-28.81 ***	-11.91 *	-6.91	4.10	-13.83 **	-0.22
Pretax Income to Sales	-49.57 ***	-6.93	-16.62 *	8.35	-15.15 *	-8.37
Pretax Income to Total Assets	-50.00 ***	-12.80	-21.01 **	3.01	-25.15 **	-9.53
Sales per Employee	14.64 ***	2.51 *	15.80 ***	0.81	14.36 ***	-2.66
Output per Employee	11.33 ***	4.36 *	11.20 ***	0.91	11.49 ***	1.69
Panel B: Partitioned on Stated Reasons on a Subset with Announced Cutbacks greater than 5% ^{d,c}						
	(n=142)		(n=21)		(n=43)	
Profit Margin on Sales	-48.23 ***	-14.76	-3.44	49.28 **	-12.01	-13.32
Return on Assets	-56.52 ***	-21.86 *	-8.62	39.71 *	-18.42 *	-8.80
Return on Equity	-36.12 ***	-49.96 **	-5.75	2.59	-13.38	-13.55
Sales to Total Assets	-4.64	0.83	-5.80	-3.95 *	-4.72 **	-5.63 **
Market to Book Ratio of Equity	-13.67	-2.28	14.71	-1.50	7.13 **	-0.96
Operating Income to Sales	-28.97 ***	-16.90	6.88	18.50 **	-8.03	-0.83
Operating Income to Total Assets	-34.35 ***	-11.54	-2.23	7.00	-14.23 *	0.62
Pretax Income to Sales	-49.57 ***	-14.68	0.78	45.44	-15.27	-16.21
Pretax Income to Total Assets	-49.68 ***	-16.45	-5.79	45.95	-18.76	-22.25
Sales per Employee	13.58 ***	1.49	13.91 ***	-6.54	14.96 ***	-6.27
Output per Employee	15.58 ***	3.91 **	10.20 ***	-4.67	15.77 ***	1.54

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

^a Median values are reported and level of significant is evaluated using a Wilcoxon signed-ranks test.

^b Number of observations (n) for market to book ratio of equity and output per employee are smaller than the total number of sample firms and the number of available observations changes slightly each year. There are 54 fewer observations for market to book ratio of equity and 12 fewer observations for output per employee on year 0 for the entire sample 423 firms after adjusted for that of the comparison firms.

^c Changes in employment level is computed by subtracting the total number of employees in year -1 from the total number of employees in year +2 and then divided by employment level in year -1.

^d Percentage of announced layoffs is computed by dividing the total number of employees stated in the layoff announcements by the total number of employees at year -1.

^e A Wilcoxon signed-ranks test is used to assess the statistical significance of adjusted changes in

Table 15. (Continued)

performance between the "reduction in operations subsample" and the "improved efficiency subsample" for both subsets of sample firms, and p-values are presented below:

Performance Variables	Subset of Sample Firms	
	Actual Decline in Employees	Announced Layoffs greater than 5%
Profit Margin on Sales	(0.0469)	(0.0595)
Return on Assets	(0.0452)	(0.0658)
Return on Equity	(0.1323)	(0.1602)
Sales to Total Assets	(0.2811)	(0.5407)
Market to Book Ratio of Equity	(0.8323)	(0.8224)
Operating Income to Sales	(0.2793)	(0.1095)
Operating Income to Total Assets	(0.1475)	(0.1454)
Pretax Income to Sales	(0.1747)	(0.1969)
Pretax Income to Total Assets	(0.1809)	(0.2277)
Sales per Employee	(0.9296)	(0.4208)
Output per Employee	(0.9195)	(0.3570)

sample firms does not strengthen or change earlier results obtained from the entire sample. In addition to the above findings, a Wilcoxon signed-ranks test between the "reduction in operations subsample" and the "improved efficiency subsample" formed from both subsets does not reveal any increase in heterogeneity between those two subsamples from both subsets compared to that from the entire sample.⁴³

Regardless of the change in profitability, all subsamples are associated with an increase in productivity in the subsequent period. Specifically, the "reduction in operations subsample" is generally associated with a deterioration in profitability but an improvement in productivity. In order to understand the puzzling result on profitability and productivity observed on the entire sample and on the "reduction in operations subsample", I compute the percentage changes in sales and the percentage changes in

⁴³ Results of the test are reported in footnote 5 of Table 14 and footnote 5 of Table 15.

Table 16. Median Percentage Change in Sales and Output
from Year -1 to Year +2^{a,b}

Variables	Reduction in Operations		Improved Efficiency		Others	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
<u>Entire Sample</u>						
Stratification by Stated Reasons						
Sales	3.20	-10.96 ***	13.84	-6.98 *	9.26	-20.84 ***
Output	0.22	-8.46 ***	7.77	-9.75	6.55	-16.67 ***
Stratification by Changes in Output						
Sales	-11.08	-22.68 ***	17.27	-8.24 **	3.55	-7.28 ***
Output	-12.28	-26.51 ***	16.60	0.60	0.16	-9.71 ***
<u>Subset</u>						
Actual Decrease in Employees						
Sales	-5.87	-17.31 ***	8.24	-14.35 ***	-4.68	-29.03 ***
Output	-9.01	-18.20 ***	3.76	-14.12 **	-7.49	-30.63 ***
Announced Layoffs greater than 5% of Employees						
Sales	2.31	-13.19 ***	14.04	-14.35 *	6.88	-20.84 *
Output	-3.84	-9.85 ***	10.88	-6.16	-0.69	-22.27 *

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

^a Median values are reported and level of significant is evaluated using a Wilcoxon signed-ranks test.

^b The percentage changes in sales or output between the “reduction in operations subsample” and the “improved efficiency subsample” are compared using a Wilcoxon signed-ranks test. The “improved efficiency subsample” has a larger increase in sales and output relative to the “reduction in operations subsample” during the period year -1 to year +2 for subsamples formed on the entire sample or on subsets of the entire sample.

output for the period year -1 to year +2. The median changes for all subsamples are reported in Table 16.

As shown in Table 16, the “reduction in operations subsample” has a lower or negative growth in sales during the 3-year interval compared to its control firms and to the

“improved efficiency subsample”. This finding suggests that the observed improvement in productivity by the “reduction in operations subsample” is driven by a larger reduction in employees compared to its control firms. For the “improved efficiency subsample”, its productivity measure does not improve despite a reduction in workforce. This finding is possibly due to a larger increase in sales by the control firms which fully compensates for the reduction in workforce of the subsample. Another possible explanation for a deterioration in profitability but an improvement in productivity is increasing use of contingent workers or outsourcing production. Contingent workers are people hired by companies to cope with unexpected or temporary challenges--part-timers, freelancers, subcontractors, and independent professionals.⁴⁴ Use of contingent workers reduces the number of permanent employees, which leads to improvement in productivity per permanent employees but does not necessarily lead to an improvement in profitability. Similarly, outsourcing production could be one of the reasons of finding an improvement in productivity.

Stock Price Reactions

Table 17 reports the mean and the cumulative prediction errors for intervals between day -90 to day +90 on the subsamples. As shown in Panel A of Table 17, and similar to the finding in Worrell, Davidson, and Sharma (1991), stock prices react negatively to announcements with reduction of operations as the stated reason, but no significant stock price reactions are seen relating to the rest of the layoff announcements

⁴⁴ “The Contingency Workforce”, *Fortune*, January 24, 1994, p.30-36.

on the two day interval, day -1 to day 0. In addition, the mean cumulative prediction errors is significantly positive for the period day +1 to day +90 for the layoff announcements caused by reduction in operations and the layoff announcements of other reasons.⁴⁵ Panel B of Table 17 reports the results when the layoff announcements are stratified by output. As shown in Panel B, stock prices react negatively to all layoff announcements on the two day interval, day -1 to day 0 but then positively on day +1 to day +90. As mentioned earlier in this chapter, stock price reactions on the entire sample, this study has no explanation for the positive reaction in the subsequent period.

⁴⁵ Results are similar when returns from the value-weighted index are used as the market returns.

Table 17. Mean and Median Cumulative Prediction Errors Around the Announcement Day for 1052 Layoff Announcements During 1989 to 1991 Partitioned on Reasons for the Layoffs^a

	Mean and Median Cumulative Prediction Errors									
	Days									
	-90 to +90	-90 to -5	-5 to +5	-2	-1	0 -1 to 0	+1	-1 to +1	+1 to +90	
Panel A: Stratification by Stated Reason										
<u>Reduction in Operations (n=599)</u>										
Mean	0.0149	-0.0473	-0.0156	0.0005	-0.0021	-0.0091	-0.0112	-0.0022	-0.0134	0.0762
P-value ^b	(0.4344)	(0.0001)	(0.0027)	(0.7757)	(0.2253)	(0.0002)	(0.0002)	(0.3398)	(0.0005)	(0.0001)
(Z-statistic) ^b	-0.08	-5.11	-3.86	1.24	-1.71	-7.04	-6.13	-3.99	-7.32	5.72
Median	0.0092	-0.0373	-0.0077	-0.0008	-0.0015	-0.0025	-0.0039	-0.0027	-0.0027	0.0324
p-value ^b	(0.5673)	(0.0089)	(0.0025)	(0.3268)	(0.0335)	(0.0054)	(0.0273)	(0.0089)	(0.0601)	(0.0004)
% negative	48.75%	55.43%	56.26%	52.09%	54.42%	55.76%	54.59%	55.43%	53.92%	42.74%
<u>Improved Efficiency (n=139)</u>										
Mean	0.0163	0.0000	-0.0080	-0.0012	-0.0006	-0.0020	-0.0026	-0.0013	-0.0039	0.0220
P-value	(0.5238)	(0.9986)	(0.1317)	(0.5319)	(0.7105)	(0.2391)	(0.3239)	(0.5458)	(0.1862)	(0.1809)
(Z-statistic)	0.41	-0.44	-1.15	-0.54	-0.09	-1.13	-0.75	-1.88	-1.67	1.30
Median	-0.0020	-0.0014	-0.0025	-0.0019	-0.0004	-0.0017	-0.0005	-0.0026	-0.0025	-0.0008
P-value	(0.8654)	(0.8654)	(0.7345)	(0.0414)	(0.8654)	(0.1745)	(0.7345)	(0.0895)	(0.3088)	(1.0000)
% negative	51.08%	51.08%	51.80%	58.99%	51.08%	56.12%	51.80%	57.55%	54.68%	50.36%
<u>Others (n=314)</u>										
Mean	0.0307	-0.0117	-0.0070	0.0008	-0.0018	-0.0026	-0.0044	0.0011	-0.0034	0.0471
P-value	(0.1478)	(0.3432)	(0.1768)	(0.5795)	(0.2655)	(0.2364)	(0.1051)	(0.4911)	(0.2648)	(0.0013)
(Z-statistic)	0.92	-0.56	-1.01	0.88	-0.48	-1.27	-1.24	-0.53	-1.32	2.26
Median	-0.0023	-0.0045	-0.0048	0.0000	-0.0017	-0.0023	-0.0013	-0.0015	-0.0035	0.0124
P-value	(0.9550)	(0.6929)	(0.0898)	(0.9100)	(0.1748)	(0.0545)	(0.3089)	(0.2136)	(0.0175)	(0.4977)
% negative	50.32%	51.27%	54.78%	49.36%	53.82%	55.41%	52.87%	53.50%	56.69%	47.77%

Table 17. (Continued)

	Mean and Median Cumulative Prediction Errors									
	Days									
	-90 to +90	-90 to -5	-5 to +5	-2	-1	0	-1 to 0	+1	-1 to +1	+1 to +90
Panel B: Stratification by Changes in Output										
<u>Reduction in Operations (n=175)</u>										
Mean	0.0209	-0.0626	-0.0077	0.0023	-0.0066	-0.0034	-0.0100	0.0056	-0.0044	0.0945
p-value ²	(0.5476)	(0.0010)	(0.3840)	(0.5695)	(0.0481)	(0.3825)	(0.0312)	(0.2196)	(0.4337)	(0.0003)
(Z-statistic) ²	0.23	-2.73	-0.73	0.55	-2.27	-2.40	-3.29	1.10	-2.07	3.32
Median	-0.0025	-0.0399	-0.0080	0.0000	-0.0018	-0.0053	-0.0082	-0.0022	-0.0051	0.0447
p-value ²	(1.0000)	(0.0491)	(0.0809)	(0.8202)	(0.1111)	(0.0011)	(0.0276)	(0.2554)	(0.0276)	(0.0121)
% negative	50.29%	57.71%	56.57%	48.57%	56.00%	62.29%	58.29%	54.29%	58.29%	40.00%
<u>Improved Efficiency (n=430)</u>										
Mean	0.0096	-0.0221	-0.0067	-0.0005	-0.0030	-0.0046	-0.0076	-0.0016	-0.0092	0.0414
p-value	(0.5616)	(0.0444)	(0.1096)	(0.7371)	(0.0661)	(0.0359)	(0.0076)	(0.3624)	(0.0086)	(0.0005)
(Z-statistic)	-0.39	-2.47	-1.75	0.12	-1.74	-3.13	-3.42	-2.40	-4.17	2.40
Median	0.0034	-0.0104	-0.0032	-0.0017	-0.0019	-0.0016	-0.0022	-0.0028	-0.0034	0.0100
p-value	(0.9615)	(0.2673)	(0.1928)	(0.1114)	(0.1114)	(0.3595)	(0.1348)	(0.0079)	(0.0479)	(0.4124)
% negative	49.77%	52.79%	53.26%	53.95%	53.95%	52.33%	53.72%	56.51%	54.88%	47.91%

Table 17. (Continued)

	Mean and Median Cumulative Prediction Errors									
	Days									
	-90 to +90	-90 to -5	-5 to +5	-2	-1	0	-1 to 0	+1	-1 to +1	+1 to +90
Others (n=353)										
Mean	0.0344	-0.0133	-0.0129	-0.0010	0.0008	-0.0045	-0.0037	-0.0033	-0.0070	0.0562
P-value	(0.1068)	(0.2633)	(0.0186)	(0.5558)	(0.6253)	(0.0331)	(0.1804)	(0.0821)	(0.0145)	(0.0001)
(Z-statistic)	1.65	-1.26	-2.77	0.31	1.03	-3.00	-1.39	-4.08	-3.47	4.31
Median	0.0126	-0.0091	-0.0056	-0.0012	-0.0010	-0.0013	-0.0006	-0.0015	-0.0027	0.0262
P-value	(0.6703)	(0.6703)	(0.0077)	(0.1360)	(0.2014)	(0.0430)	(0.7495)	(0.0702)	(0.3945)	(0.0430)
% negative	48.73%	51.27%	57.22%	54.11%	53.54%	55.52%	50.99%	54.96%	52.41%	44.48%

^a The cumulative prediction errors are obtained from prediction errors estimated by the market model with returns from size-adjusted index as the market returns, and day -291 to day -91 as the estimation period.

^b P-values (in parentheses) are based on a t-test on means and a Wilcoxon signed-ranks test on medians for the null hypothesis that mean (median) cumulative prediction error is zero. Z-statistic is calculated using the method of Mikkelson and Partch (1988).

CHAPTER VI

CONCLUSION

This study extends prior research on layoffs by distinguishing between the reason for the layoffs and by using a larger sample than prior studies. Contrary to the previous studies, this study finds that changes in performance are generally similar to that of the control firms for the entire sample. When sample firms are partitioned according to reasons stated in layoff announcements, I find some evidence of an association between reasons for the layoffs and changes in performance. Table 18 summarizes the hypotheses tested and the findings.

For the entire sample, the results indicate that firms announcing layoffs have lower profitability in the layoff announcement year and in the following two years relative to control firms. The changes in profitability are statistically significant before adjusting for the change in performance of control firms but are generally not statistically significant after this adjustment is made.

Because layoffs are driven by different economic reasons, the association between layoffs and the change in performance is expected differ depending on the underlying reason for the layoff. The results generated by pooling firms with different reasons for the layoffs can be misleading. Therefore, I partition sample firms according to the reasons for the layoffs and then examine the change in performance for each group. This study uses

Table 18. Summary of Hypotheses and Findings

Hypotheses	Findings
<u>Entire Sample</u>	
H1a: Performance remains unchanged following layoffs	On average, sample firms are associated with a deterioration of profitability, which is inconsistent with H1a.
H1b: The change in performance is similar to the change for the control firms.	The change in performance does not differ from their control firms, which is consistent with H1b.
H1c: Stock prices do not react to the layoff announcements.	Stock prices react negatively to layoff announcements on the two-day interval, which is inconsistent with H1c.
<u>Reduction in Operations Subsample</u>	
H2a: Profitability becomes worse following layoffs.	Profitability declines in the subsequent period relative to its prior period, which is consistent with H2a.
H2b: The change in profitability is less than the change for the control firms.	Relative to control firms, changes in profitability are generally negative and statistically significant in some measures, which provides partial support for H2b.
<u>Improved Efficiency Subsample</u>	
H3a: Profitability improves following layoffs.	Profitability in the subsequent period does not differ from the prior period, which is inconsistent with H3a.
H3b: Productivity improves following layoffs.	Productivity in the subsequent period exceeds the prior period, which is consistent with H3b.
H3c: The change in profitability exceeds the change for the control firms.	Relative to control firms, changes in profitability are generally positive and statistically significant in some measures, which provides partial support for H3c.
H3d: The change in productivity exceeds the change for the control firms.	Changes in productivity do not differ from control firms, which is inconsistent with H3d.

the layoffs and then examine the change in performance for each group. This study uses reasons stated in the layoff announcements and changes in output to identify the reasons for the layoffs. A comparison between the subsamples formed using both stratification

methods indicate that subsamples formed according to changes in output are fairly homogeneous in performance, whereas subsamples formed according to reasons stated in the layoff announcements are associated with considerable differences in performance. I find some evidence supporting an association between layoffs and changes in performance when subsamples are formed according to reasons stated in layoff announcements. Also, the direction of this association differs between the “reduction in operations subsample” and the “improved efficiency subsample”. However, I do not find such evidence when sample firms are partitioned according to changes in output.

When sample firms are stratified according to the reasons stated in layoff announcements, I find that the “reduction in operations subsample” suffers from declining profitability. The subsample performs worse than its control firms in year 0 and in each year of the subsequent two years. Despite an improvement in productivity, changes in profitability are consistently negative over the period year -1 to year +2. I also find that the change in profitability for sample firms citing reduction in operations is negative and statistically significant in certain profitability measures comparing to their control firms. While on the contrary, the subsequent profitability of the “improved efficiency subsample” is generally not statistically significant. Further, the change in performance for sample firms citing improved efficiency is greater than their control firms in certain profitability measures. On the other hand, the productivity improves in the subsequent period for the “improved efficiency subsample” relative to its prior period, but the improvement is not statistically significant relative to the control firms.

The lack of strong supporting evidence can be caused by the workforce reduction

being too small or the workforce reduction being offset by new hirings. To control for these potential problems, the tests are repeated on subsets of firms with either a subsequent decline in employees or announced layoffs greater than 5% of employees in year -1. The results from subsamples formed on subsets of sample firms are similar to that on the entire sample.

In addition to accounting performance, I examine stock price reactions to layoff announcements. The findings on stock price reactions are consistent with the results in a previous study. For the entire sample, stock prices react negatively on the two-day interval, day -1 to day 0 but positively in the subsequent period, day +1 to day +90. When announcements are grouped according to reasons stated in layoff announcements, stock prices react negatively on the same two-day interval to announcements in the “reduction in operations subsample” and in the “others subsample”, but again positively in the subsequent interval. However, I do not find a significant price reaction for firms announcing layoffs citing improved efficiency. When announcements are partitioned according to changes in output, stock price reactions are the same for all three subsamples, that is, stock prices react negatively on the two-day interval, day -1 to day 0, and stock prices react positively on the subsequent interval, day +1 to day +90.

In conclusion, my findings suggest that observing the change in performance for a firm that announces layoff can be misleading. Though the subsequent performance of firms announcing layoffs differs from their prior period, the change in performance is often similar to their control firms. Also, my results support the claim that the change in performance differs according to underlying economic reasons for the layoffs. Firms that

layoff employees due to a reduction in operations are likely to perform poorly compared to other firms of similar size in the same industry. On the other hand, firms that layoff employees due to improved efficiency are likely to perform better than other firms of similar size in the same industry. Therefore, pooling layoff firms together makes it difficult to detect changes in performance. Last, the empirical evidence indicates that the association between layoffs and changes in performance varies by the choice of performance measures.

APPENDIX A

SUMMARY OF STUDIES ON STOCK PRICES REACTION AND FINANCIAL
PERFORMANCE AROUND LAYOFF ANNOUNCEMENTS

Summary of Studies on Stock Prices Reaction and Financial Performance Around Layoff Announcements

Authors	Sample Period	Sample Size	Control	Performance
Worrell, Sharma and Davidson, (1991)	1979-1987	194 layoff announcements <ul style="list-style-type: none"> • 87 announcements citing financial distress • 30 announcements citing restructuring and consolidation 		Stock prices reaction
De Meuse, Vanderheiden, and Bergmann (1994)	1989	17 Fortune 100 firms	Size	Financial performance
Elayan, Maris, Scott, and Swales (1995 working paper)	1979-1991	646 layoff announcements <ul style="list-style-type: none"> • 296 announcements citing operation not profitable • 275 announcements citing restructuring 		Stock prices reaction
		272 firms to 417 firms with data available on Compustat	Industry	Change in performance
Iqbal and Akhigbe (1995 working paper)	1985-1990	37 announcements <ul style="list-style-type: none"> • 18 announcements contain no good news • 11 announcements contain good news 		Stock prices reaction
		48 firms with data available on Compustat <ul style="list-style-type: none"> • 19 firms with announcements contain no good news • 20 firms with announcements contain good news 	Industry	Change in performance

APPENDIX B

DETAIL DEFINITION OF VARIABLES

DETAIL DEFINITION OF VARIABLES

Variable names	Definition	Source & Item Number
Accounting Performance^{a,b}		Compustat
Profit margin on sales	$\frac{\text{Income before extraordinary items}}{\text{Sales}}$	$\frac{A18}{A12}$
Return on assets	$\frac{\text{Income before extraordinary items}}{\text{Average total assets}}$	$\frac{A18_t}{(A6_t + A6_{t-1})/2}$
Return on equity	$\frac{\text{Income before extraordinary items}}{\text{Average common equity}}$	$\frac{A18_t}{(A60_t + A60_{t-1})/2}$
Sales to total assets	$\frac{\text{Sales}}{\text{Average total assets}}$	$\frac{A12_t}{(A6_t + A6_{t-1})/2}$
Market to book ratio of equity	$\frac{\text{Monthly close price} \times \text{quarterly common shares outstanding}}{\text{Quarterly common equity}}$	MKBK
Operating income to sales	$\frac{\text{Operating income after depreciation}}{\text{Sales}}$	$\frac{A178}{A12}$
Operating income to assets	$\frac{\text{Income before extraordinary items}}{\text{Average total assets}}$	$\frac{A178_t}{(A6_t + A6_{t-1})/2}$
Pretax income to sales	$\frac{\text{Pretax income}}{\text{Sales}}$	$\frac{A170}{A12}$
Pretax income to assets	$\frac{\text{Pretax income}}{\text{Average total assets}}$	$\frac{A170_t}{(A6_t + A6_{t-1})/2}$
Sales per employee	$\frac{\text{Sales}}{\text{Average number of employees}}$	$\frac{A12_t}{(A29_t + A29_{t+1})/2}$
output per employee	$\frac{\text{Cost of goods sold} + (\text{Ending inventory} - \text{Beginning inventory})}{\text{Average number of employees}}$	$\frac{A41_t + (A3_t - A3_{t-1})}{(A29_t + A29_{t+1})/2}$

Variable names	Definition	Source & Item Number
Stock price performance		
Cumulative prediction errors	Prediction error $R_{jt} = R_{jt} - (a_j + b_j R_{mt})$	CRSP

^a All accounting variables for sample and comparison firms are collected from Compustat based on fiscal year end.

^b For firms announcing layoffs in the first fiscal quarter, announcement year (Year 0) is the previous year.

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