

Stock Price and Operating Performance of ESOP Firms: A Time-Series Analysis

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Prior literature suggests that the impact of employee ownership on employee behavior may depend on the financial rewards associated with ownership. As the financial value of ownership accounts increases, employee attitudes become more positive, which, in turn, improves organizational performance. In this paper, we explore this financial perspective of employee ownership by examining the relationship between stock price and operating performance of ESOP firms. Using aggregate quarterly data, we find that large increases in stock prices result in improved operating performance for ESOP firms. Our findings are, however, anomalous for ESOP firms that experience falling stock prices. Contrary to our expectation, these firms show improvement in operating performance. Overall, we provide new evidence that stock return is an important link in the ownership-performance relationship. Corporate planners and public policy makers may assess ESOP's contribution to corporate performance in relation to company's stock returns.

Introduction

Prior empirical studies observe positive effects of an employee stock ownership plan (ESOP) on a firm's operating performance (Park and Song, 1995; Blasi, Kruse, and Conte, 1992; Conte and Tannenbaum, 1978; Marsh and McAllister, 1981; Rosen and Klein, 1983; Quarrey, 1987; U.S. General Accounting Office, 1988; Rooney, 1990; and Wagner and Rosen, 1985). Klein (1987) identifies three theoretical perspectives that relate employee ownership to employee behavior and firm performance. The intrinsic satisfaction model suggests that the effects of employee ownership result directly from ownership. The instrumental satisfaction model proposes effects of ownership through employee participation. The extrinsic satisfaction model suggests that employee ownership increases organizational commitment and performance if ownership is financially rewarding to employees. This idea of financial orientation is raised by French (1987) who argues that employees may approach

ownership system with strictly an investment expectation. This view is also consistent with Jensen and Meckling's (1976) agency theory that financial incentives such as employee ownership may make the interests of the employees align with those of the stockholders.

In this paper, we explore the financial perspective of employee ownership by empirically examining the relationship between stock returns and operating performance of ESOP firms. We take the view that company stock price affects the value of the ESOP accounts, which in turn influences organizational commitment and productivity of the employees. Specifically, employees of the ESOP firm will be more (less) committed and productive in the workplace if stock appreciates (declines) in value thus improving (reducing) operating performance.¹

Our data show a positive relationship between stock price and subsequent operating performance of ESOP firms. Further analysis indicates that this positive relationship is true for ESOP firms with large price appreciations. The relationship between stock returns and operating performance is insignificant when stock prices change modestly, and it is negative when prices decrease substantially.

Background and Hypotheses

An ESOP is a deferred employee benefit plan through which employees acquire company stock. An ESOP company donates stock, or cash to buy stock, to an ESOP trust. The stock is allocated to individual employee accounts, usually based on the employee's salary level. The trust account of the employees increases in value through employer contributions and through appreciation in the price of the company stock.

Advocates of employee ownership claim that ESOPs increase employee commitment and productivity. Smith, Lazarus, and Kalkstein (1990) state that ESOPs represent a potential employee motivator and morale booster. Webb (1912) speculates that by making [an employee] a shareholder in the business employing him ... it stimulates his zeal and careful working [cited in Pierce, Rubinfeld, and Morgan (1991, p. 121)]. An article in the *U.S. News and World Report* (1976) states that when a worker is given a piece of the action, he will be motivated to work harder, gripe less. Turnover, absenteeism, and grievances all may diminish.

Klein (1987) identifies three theoretical perspectives explaining the effects of employee ownership on employee attitudes and behaviors. The first model is the intrinsic satisfaction model, which suggests that employee ownership alone increases employee commitment to, and satisfaction with, the organization. The intrinsic feeling of being a part owner of the company has a direct influence on employee atti-

¹ The relationship between stock price and subsequent firm performance also may be observed when stockholders react to announcements of a future events affecting operating performance. For example, a layoff announcement may elicit positive stock price reactions today, while the improvement in earnings occurs when the employees are laid off.

tudes and behaviors. There is limited empirical support for the intrinsic satisfaction model, however (Rhodes and Steers, 1981; Klein, 1987). The second model is the instrumental satisfaction model, which posits that ownership provides control and decision-making opportunities thereby affecting employee behavior. It is not merely the fact of ownership, but the added control and influence brought by ownership that affect employee attitudes and behaviors. Empirical findings show that control is an important moderator of the ownership-attitude relationship (Hammer and Stern, 1980).

The third model, the extrinsic satisfaction model, suggests that employee ownership is viewed as a financial investment by employees. As French (1987) discusses, employee-owners' satisfaction with the firm and their jobs depends on the financial incentive associated with ownership. If ownership is seen by employees as financially rewarding, there will be greater feelings of satisfaction and greater commitment to the company. Smith, Lazarus, and Kalkstein (1990) propose that ESOPs will improve employee motivation and morale because of increased financial incentive. According to them, one of the most fundamental appeals of ESOPs is that employees share and therefore, presumably, will take an interest in the equity growth of their companies. As the financial value of the stock accounts increases, employee attitudes become more positive. Similarly, Buchko (1992) states that the effects of employee ownership are primarily due to the financial rewards that accrue from the value of the employee's investment in the company and the appreciation in the value of shareholdings. In a related study, Pierce, Rubinfeld, and Morgan (1991) present a model where financial incentive is one of the preconditions that influence employee reactions to the ownership system

To empirically investigate the extrinsic satisfaction, i.e., the financial perspective of ESOP, Klein (1987) computes correlations between the return on company stock and three measures of employee attitude (satisfaction with the plan, organizational commitment, and turnover intention) for a sample of 37 ESOP firms. She hypothesizes that, as the price of company stock increases, employees' stock accounts become more valuable, which in turn increases employee satisfaction and commitment and reduce turnover. She detects a correlation of 0.29 (significant at the 10 percent level) between stock return and organizational commitment. A later study by Klein and Hall (1988) finds a significant correlation between company's stock return and satisfaction with the ESOP plan. In sum, there is some empirical support that employee-owners perceive the company's stock return as an important financial variable that affects their organizational commitment and satisfaction.

In addition to the above lines of research, several studies have explored the effects of an ESOP on the financial performance of the firm. To the extent that employee ownership has behavioral effects on the employees in the desired direction, there may be a corresponding positive effect on the financial performance of ESOP firms. Empirical studies by Park and Song (1995), Blasi, Kruse, and Conte

(1992), Conte and Tannenbaum (1978), Marsh and McAllister (1981), Rosen and Klein (1983), Quarrey (1987), U.S. General Accounting Office (1988), Rooney (1990), and Wagner and Rosen (1985) detect positive effects of employee ownership on various measures of operating performance.

In this study, we relate operating performance of ESOP firms to the financial benefits of employee ownership. We take the view that higher returns on the company's stock are financially rewarding to the employee-owners, and, therefore, should have a favorable impact on their attitudes and behaviors. This in turn should improve firm's operating results. The reverse should be true when stock of the ESOP firm declines in value. The specific hypotheses examined are:

Hypothesis 1: There is a positive relationship between stock price and subsequent operating performance of ESOP firms.

It is possible that the employee-owners react only when there are large changes in stock prices. Small changes in stock prices may not trigger any noticeable impact on employee productivity and firm performance.

Hypothesis 2: The positive relationship is stronger when stock price of the ESOP firm appreciates or depreciates substantially.

In other words, large increases in stock price are associated with large increases in operating performance and large decreases in stock price are associated with large decreases in operating performance. Also, minor changes in stock price may not result in large change in operating performance.

Sample and Data Collection

We obtain an initial sample of 156 publicly traded firms that adopted an ESOP in 1988 or before. This sample is obtained from a list of ESOP firms compiled by the *National Center for Employee Ownership (NCEO)*. Using 1988 as the cutoff year ensures that at least 40 quarterly data points are available after the ESOP adoption. The last quarter for which we can obtain data from the Compustat database is the fourth quarter of 1998. Of the 156 ESOP firms, 80 are deleted because of insufficient data on the Compustat database. The final sample includes 76 firms (48.7 percent of the initial sample).

We construct a control sample by matching each ESOP firm with a non-ESOP firm of similar size (measured by total employees) one year prior to the ESOP adoption that has the same four-digit standard industrial classification (SIC) code. In cases where a control firm has insufficient data on the Compustat database, we select a different firm with the next closest total employees. There are 73 control firms instead of 76, because one ESOP firm has no matching firm with the same four-digit SIC code. In two instances, two ESOP firms are matched with the same control firm. We ensure that the control firms are not on the list of NCEO.

Descriptive Statistics

Table 1 provides some descriptive information on the ESOP and control firms. Panel A reports that the mean and median employee ownerships are 17.5 percent and 14.0 percent, respectively, with a maximum ownership of 75.0 percent and a minimum of 5.0 percent. Twenty-five percent of the ESOP firms have 9.0 percent ownership or less, and 25 percent have 22.0 percent ownership or higher. Twenty-nine firms adopted ESOPs in 1988, 14 firms in 1987, 5 firms in 1986, 10 firms in 1985, and the remaining 18 firms adopted ESOPs in 1984 or before.

Panel B reports the average values of selected variables over 40 quarters following the adoption of ESOP. The operating income before depreciation (hereafter operating income) is \$108.29 million for the ESOP firms and \$90.43 million for the control firms.² The ESOP firms have more employees, however. They have 17.73 thousand employees compared to 12.35 thousand employees for the control firms. Per employee, the ESOP firms generate operating income of \$5.99, while the control firms generate \$7.32. With respect to stock price, the ESOP and control firms are almost identical. The ESOP firms have an average stock price of \$17.23, and the control firms have an average price of \$17.62.

Table 1—Descriptive Statistics of the 76 ESOP Firms and 73 Control Firms

Panel A Descriptive Statistics				
Ownership Percentage for ESOP Firms		Year ESOP Adopted	Number of Firms	Percentage
Mean	17.5%	1988	29	38%
Median	14.0%	1987	14	18%
25 Percentile	9.0%	1986	5	7%
75 Percentile	22.0%	1985	10	13%
Minimum	5.0%	1984 & before	18	24%
Maximum	75.0%		Total 76	100%

Panel B Quarterly Statistics		
	ESOP	Control
Operating Income	\$108.29	\$90.43
Total Employees	17,730	12,350
Operating Income per Employee	\$5.99	\$7.32
End-of-Quarter Stock Price	\$17.23	\$17.62

Preliminary Findings

Table 2 presents preliminary findings on stock price and operating performance over 40 quarters following the adoption of the ESOP. The findings are reported for the total sample and for three subsamples based on changes in stock prices. To construct the subsamples, we first compute quarterly change in stock price defined as

² Compustat PCPlus database defines operating income before depreciation as net sales less cost of goods sold and selling, general, and administrative expenses before deducting depreciation, depletion, and amortization.

Table 2—Preliminary Findings on Stock Price and Operating Performance Measures for the Total Samples and Subsamples of ESOP and Control Firms (Subsamples are constructed based on changes in quarterly stock price over 40 quarters following the establishment of ESOP.)

Panel A. Change From Quarter One to Quarter 40									
	Total Sample		Largest-Increase		Moderate-Increase		Largest-Decrease		
	ESOP	Control	ESOP	Control	ESOP	Control	ESOP	Control	
Stock Price	134%	127%	1177%	739%	141%	169%	-68%	-44%	
Operating Income	119%	3%	219%	284%	43%	-12%	70%	-80%	
Operating Income per Employee	52%	-9%	39%	83%	3%	-46%	202%	-75	
Panel B. Quarterly Change in Stock Price and Operating Performance									
	Total Sample		Largest-Increase		Moderate-Increase		Largest-Decrease		
	ESOP	Control	ESOP	Control	ESOP	Control	ESOP	Control	
Stock Price	2.2%	2.1%	6.7%	5.4%	2.3%	2.3%	-3.4%	-2.8%	
Operating Income	2.0%	0.1%	3.0%	3.5%	0.9%	-0.3%	2.2%	-4.1%	
Operating Income per Employee	0.7%	0.4%	-0.4%	1.7%	0.1%	-1.6%	3.8%	-3.3%	
Panel C. Correlation Between Stock Price and Operating Performance									
	Total Sample		Largest-Increase		Moderate-Increase		Largest-Decrease		
	ESOP	Control	ESOP	Control	ESOP	Control	ESOP	Control	
Stock Price and Operating Income	94.0%	57.5%	90.8%	94.2%	67.8%	35.3%	5.9%	24.8%	
Stock Price and Operating Income per Employee	86.2%	48.2%	28.3%	55.7%	30.8%	11.4%	-26.3%	10.3%	

Table 2 (cont.)—Preliminary Findings on Stock Price and Operating Performance Measures for the Total Samples and Subsamples of ESOP and Control Firms (Subsamples are constructed based on changes in quarterly stock price over 40 quarters following the establishment of ESOP.)

	Panel D Correlation Between Quarterly Change in Stock Price and Operating Performance					
	Total Sample		Largest-Increase		Moderate-Increase	
	ESOP	Control	ESOP	Control	ESOP	Control
Stock Price and Operating Income	12.7%	-6.7%	8.8%	-11.4%	2.4%	11.7%
Stock Price and Operating Income per Employee	14.0%	-11.6%	8.5%	-11.4%	0.1%	13.6%
	Panel E Cross-Sectional Correlation Between Stock Price and Operating Performance		Largest-Decrease			
	ESOP	Control	ESOP	Control	ESOP	Control
Stock Price and Operating Income	94.3%	58.7%	8.4%	8.7%	2.3%	0.2%
Stock Price and Operating Income per Employee	84.0%	72.1%				
	Panel F Cross-Sectional Correlation Between Quarterly Change in Stock Price and Operating Performance					
	ESOP	Control				
Stock Price and Operating Income	32.3%	11.0%				
Stock Price and Operating Income per Employee	27.1%	5.2%				

$\log (P_t/P_{t-1})$, where P_t is the quarter-end stock price. After ranking the firms in descending order by the average quarterly change in stock price, we place the top ten firms in the largest-increase group, the middle ten firms in the moderate-increase group, and the bottom ten in the largest-decrease group. The quarterly increase in stock price is 6.7 percent for the ESOP firms and 5.4 percent for the control firms in the largest-increase group. The moderate-increase categories for ESOP and control samples have an identical 2.3 percent increase in stock price. In the largest-decrease group, the ESOP firms show a 3.4 percent decrease in stock price while the control firms show a 2.8 percent decrease.

Panel A presents change in stock price and operating performance from quarter one to quarter 40. Although the total samples of ESOP and control firms experienced similar increases in stock prices (a 134 percent increase for the ESOP firms and a 127 percent for the control firms), there are noticeable differences in changes in operating performance between these two groups. Operating income increased 119 percent for the ESOP firms and only 3 percent for the control firms. Operating income per employee increased 52 percent for the ESOP firms and decreased 9 percent for the control firms. These findings are consistent with those of prior empirical studies that ESOP firms experience better operating performance than similar firms in the industry.

In the largest-increase category, both ESOP and control firms experienced improvements in operating performance. For the ESOP firms, operating income increased 219 percent, and operating income per employee increased 39 percent. For the control firms, operating income increased 284 percent, and operating income per employee increased 83 percent. In the moderate-increase group, operating income increased 43 percent for the ESOP firms, compared to a drop of 12 percent for the control firms. Operating income per employee increased 3 percent for the ESOP firms, compared to a drop of 46 percent for the control firms. In Panel A, we detect a noticeable difference in operating performance between the ESOP and control firms in the largest-decrease category. For the ESOP firms, operating income and operating income per employee increased 70 percent and 202 percent, respectively. In comparison, operating income and operating income per employee decreased 80 percent and 75 percent, respectively, for the control firms.

Panel B in Table 2 presents quarterly change in stock price and operating performance values. The results and conclusions are similar to those in Panel A that ESOP firms have higher operating performance than other firms in the same industry and that they perform significantly better if stock prices increase or decrease substantially.

Thus far, the preliminary findings in Panels A and B are consistent with the findings in prior studies that operating performance improves following the adoption of an ESOP. The findings for the largest-decrease subsample, however, appear to be

anomalous. We expect operating performance of ESOP firms to fall after stock prices decrease.

The correlation coefficients between stock price and operating performance measures over 40 quarters are reported in Panel C. The correlations are generally positive, indicating that stock price and operating performance move in the same direction with the exception of ESOP firms with large decreases in price that show a negative correlation of -26.3 percent between stock price and operating income per employee.

The correlation values between quarterly change in stock price and quarterly change in operating performance over 40 quarters are given in Panel D. Compared to those reported in Panel C, these coefficients indicate smaller correlations between changes in stock price and changes in operating performance.

Finally, Panels E and F in Table 2 present correlation coefficients of stock price and operating performance across firms. For each firm, quarterly data values are averaged across quarters, and cross-sectional correlation coefficients are computed using these average values. We find that the correlations are generally positive, indicating that high stock prices are associated with high operating performance and that large changes in stock prices are associated with large changes in operating performance. The correlation values are higher for the ESOP firms, suggesting stronger associations for ESOP firms than for control firms.

Figure 1 through Figure 8 present indices of operating income and operating income per employee over 40 quarters. The index value for each quarter is computed by averaging the operating performance measures across firms. In Figures 1 and 2, operating performance of the ESOP firms improves more than the control firms. In the largest-increase category, both ESOP and control firms show significant upward trends in operating income (Figure 3) and no clear trends in operating income per employee (Figure 4). In the moderate-increase category shown in Figures 5 and 6, there are no significant movements in operating income or operating income per employee. Finally, the largest-decrease ESOP firms show an upward trend after 12 quarters and outperform the control firms after 40 quarters (Figures 7 and 8).

Methodology

We use aggregate quarterly data in the vector autoregressive (VAR) analysis to examine the relationship between stock price and operating performance. The aggregate data for each quarter are computed by averaging stock price or operating performance values across firms. VAR procedures require that the underlying stochastic processes be stationary. Otherwise, the F-values of the regression estimates will be biased. The Dickey-Fuller and the Phillips-Perron unit root tests indicate that stock price, operating income, and operating income per employee variables are nonstat-

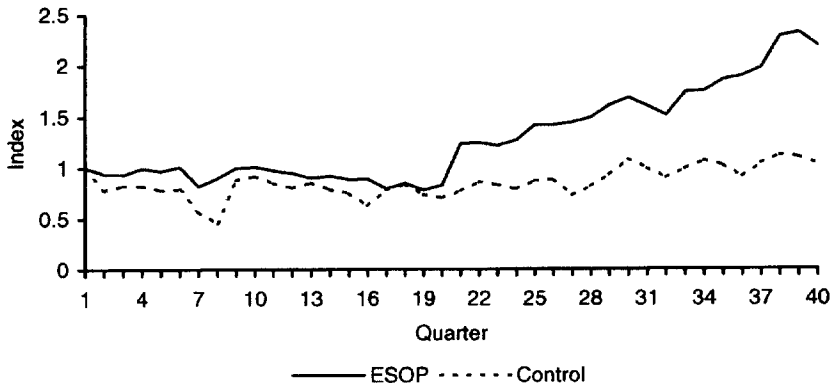
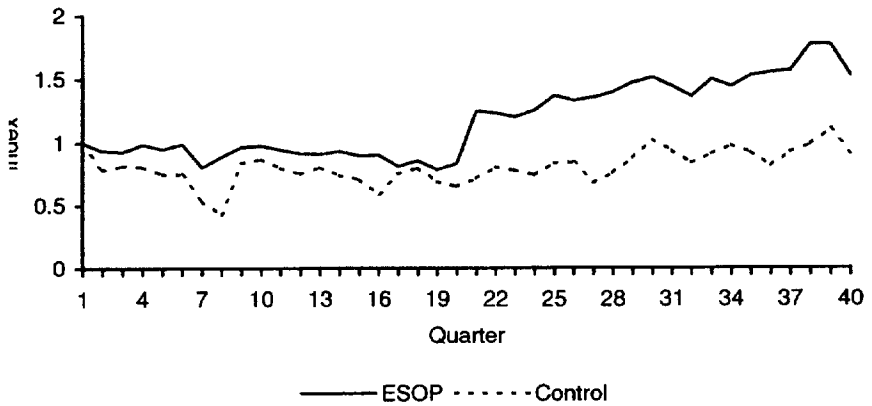
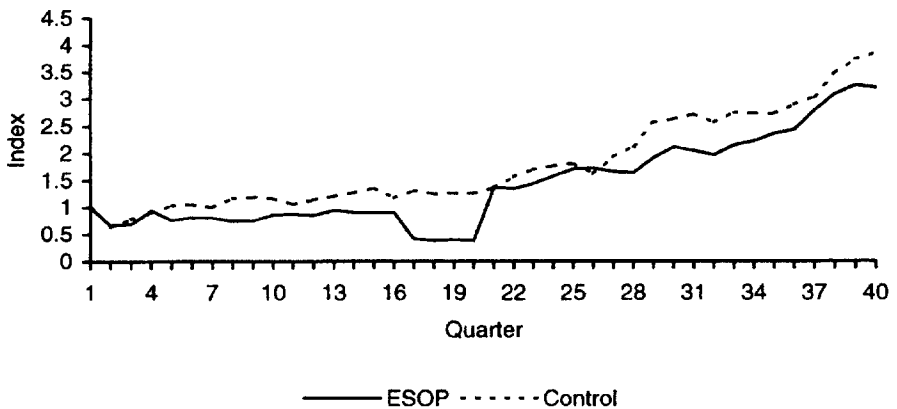
Figure 1—Index of Operating Income**Figure 2—Index of Operating Income Per Employee****Figure 3—Index of Income in Largest-Increase Category**

Figure 4—Index of Income/Employee in Largest Increase Category

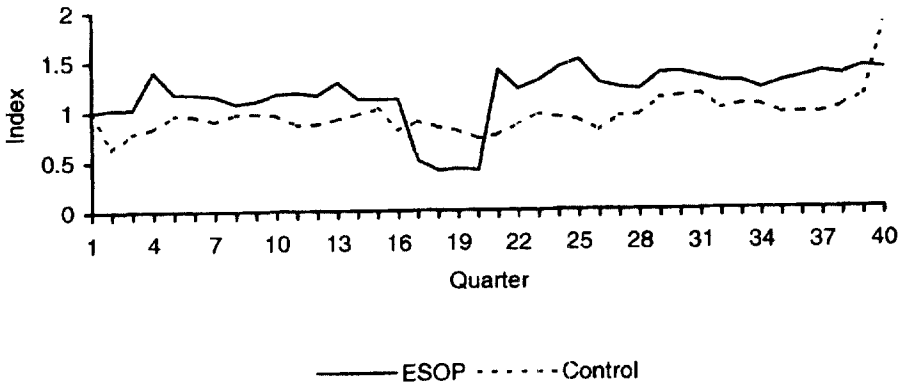


Figure 5—Index of Income in Moderate-Increase Category

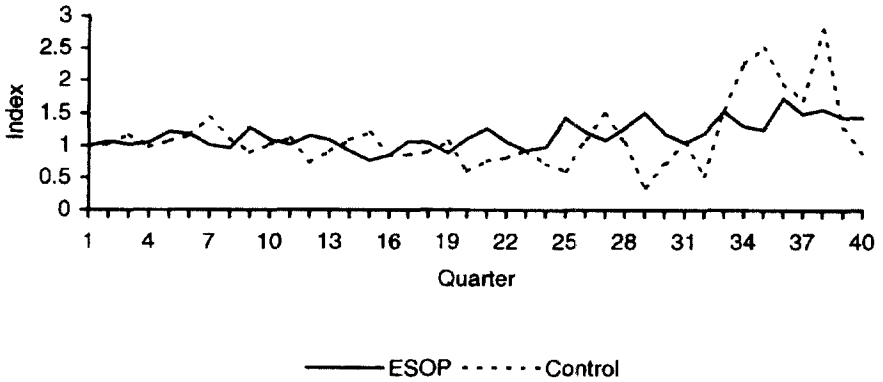


Figure 6—Index of Income/Employee in Moderate-Increase Category

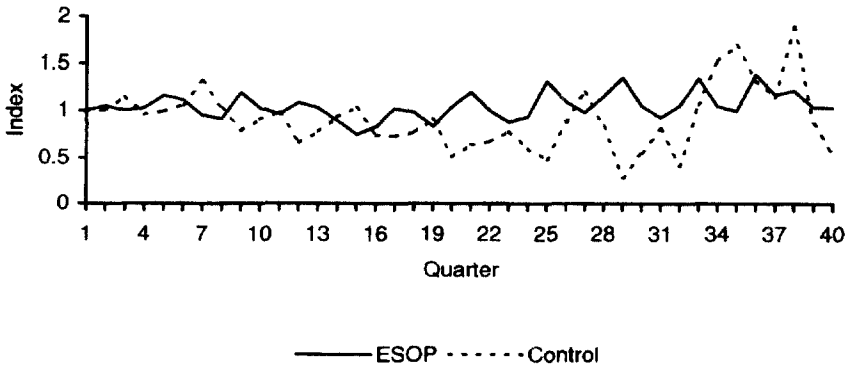
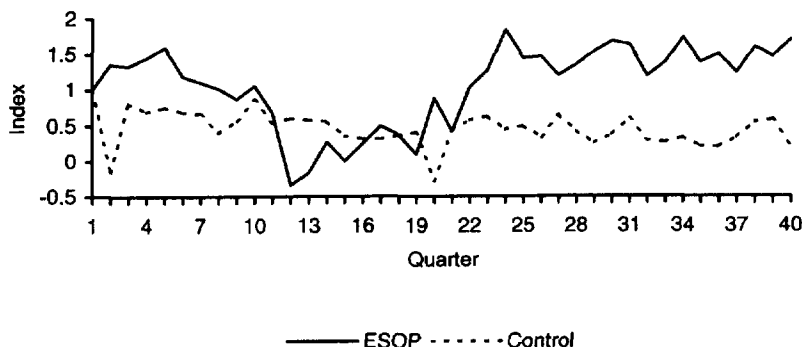
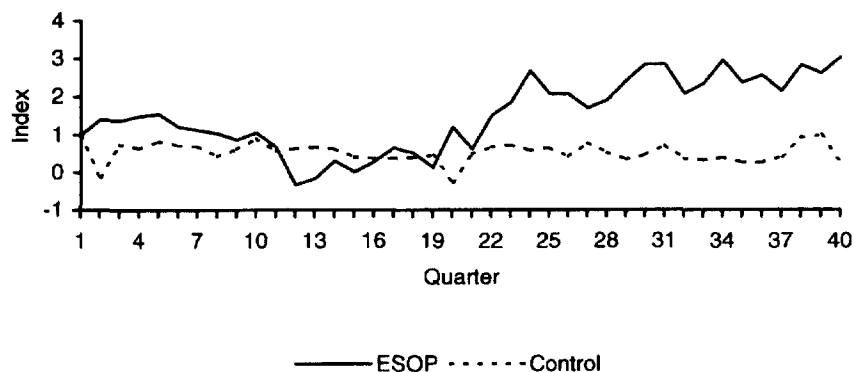


Figure 7—Index of Income in Largest-Decrease Category**Figure 8—Index of Income/Employee in Largest Decrease Category**

tionary. We, therefore, use quarterly percentage changes of these variables, which are stationary.³

Our VAR analysis provides information on (a) whether change in stock price Granger causes (Granger, 1969) change in operating performance, (b) how much of the variability in change in operating performance is due to innovation in change in stock price, and (c) the speed and direction of reaction, i.e., impulse response of change in operating performance to a shock in change in stock price.

The Granger causality model is given below:

$$(1) \Delta OP_t = \alpha + \sum_{k=1}^K \alpha_k \Delta OP_{t-k} + \sum_{j=1}^8 \beta_j \Delta P_{t-j} + \varepsilon_t$$

where:

t = The time subscript;

ΔOP_t = Percentage change in operating performance variable in quarter t ;

³ Using percentage change data reduces the number of observations to 39 quarters, from the first quarter of 1989 to the third quarter of 1998

ΔP_t = Percentage change in stock price in quarter t measured by $\log(P_t/P_{(t-1)})$ where P_t is the quarterly stock price; and

K = The number of lags for ΔOP .

The number of lags K is selected by the Akaike information criterion (AIC) (Akaike, 1973) given by $T \log(RSS) + 2K$, where RSS is the residual sum of squares and T is the number of observations.⁴ Causality from ΔP to ΔOP is tested by an F-statistic ($F_{\Delta P \rightarrow \Delta OP}$), which indicates whether the residual variance of equation (1) with ΔP omitted is significantly greater than the residual variance of the full equation 1. If so, the lags of ΔP add to the explanatory power of equation (1), i.e., change in stock price Granger causes change in operating performance.

The VAR model is expressed as

$$(2) \Delta Y_t = A_0 + \sum_{s=1}^S A_s \Delta Y_{t-s} + e_t$$

where:

ΔY_t = A 2×1 column vector of the variables (ΔP and ΔOP);

A_0 = A 2×1 column vector of constants;

A_s = A 2×2 matrix of coefficients;

S = The lag length; and

e_t = The 2×1 column vector of forecast errors of the best linear predictor of ΔY_t using all the past ΔY_{t-s} .

By successive substitution on the right side of equation (2) and making an orthogonalized transformation to e_t , the following moving average representation can be obtained:

$$(3) \Delta Y_t = \sum_{s=0}^{\infty} C_s u_t$$

where u_t is serially and contemporaneously uncorrelated orthogonalized innovation in the system and the quantity, $\sum_{s=0}^{\infty} (C_{is}^2 \div \text{MSE}_{T+1,i})$, is the proportion of the $T+1$ step forecast error variance of variable i (denoted as $\text{MSE}_{T+1,i}$) accounted for innovations in variable j . The ij^{th} element of C in equation (3) is the impulse response of variable i due to a unit standard deviation shock in variable j .⁵

Empirical Findings

Total Samples

Table 3 reports the empirical results for the total samples of ESOP and control firms. Panel A presents findings of Granger causality tests, with causality running

⁴ Initially, we use AIC to determine lag lengths for ΔP as well. We obtained eight lags for the ESOP sample and only one lag for the control sample. The results for the control sample are not significant. We then decided to use the highest significant lags (eight in this case) for ΔP in all of our regression equations

⁵ The ordering of the variables in the VAR system is determined by the Bernanke method (Bernanke, 1986) provided in the *Regression Analysis of Time Series* (RATS) software.

Table 3—Results of Granger Causality Tests with Causality from Stock Price to Operating Performance and Variance Decompositions for the Total Samples of ESOP and Control Firms**Panel A: Granger Causality Findings**

	Dependent Variable - Operating Income		Dependent Variable - Operating Income Per Employee	
	ESOP Sample	Control Sample	ESOP Sample	Control Sample
F	1.22	0.49	1.09	0.96
b ₁	0.019 (0.06)	-0.063 (-0.18)	-0.098 (-0.29)	-0.093 (-0.27)
b ₂	0.056 (0.17)	-0.363 (-0.85)	-0.142 (-0.42)	-0.514 (-1.22)
b ₃	0.276 (0.84)	-0.247 (-0.55)	0.225 (0.67)	-0.254 (-0.58)
b ₄	0.364 (0.99)	-0.049 (-0.11)	0.280 (0.75)	-0.189 (-0.42)
b ₅	-0.039 (-0.11)	0.260 (0.57)	-0.122 (-0.34)	0.299 (0.67)
b ₆	0.281 (0.86)	0.023 (0.06)	0.262 (0.79)	0.084 (0.21)
b ₇	-0.198 (-0.61)	-0.036 (-0.10)	-0.249 (-0.76)	-0.218 (-0.65)
b ₈	0.865 (2.59)**	0.401 (1.17)	0.833 (2.44)**	0.546 (1.62)

Panel B: Variance Decomposition Findings

Quarter Ahead	Variations in Operating Income				Variations in Operating Income Per Employee			
	ESOP Sample		Control Sample		ESOP Sample		Control Sample	
	SE	FEV	SE	FEV	SE	FEV	SE	FEV
1	0.075	0.2	0.056	0.3	0.077	1.1	0.056	2.0
4	0.077	3.8	0.064	5.2	0.078	4.6	0.067	14.3
8	0.081	14.6	0.068	12.8	0.082	12.3	0.074	25.3
12	0.095	36.1	0.075	17.2	0.092	30.2	0.085	33.4

SE = Standard error of forecast, FEV = Forecast error variance of operating performance variable due to a shock in stock return

*** Significant at the 1 percent level

** Significant at the 5 percent level

* Significant at the 10 percent level

Panel A reports F-statistics and the coefficient values (t-value in parentheses). Panel B provides the forecast error variance (FEV) and the standard error of forecast (SE)

from change in stock price to change in operating performance. The F-statistics and coefficients values for eight lags are reported. The results indicate that stock price has no influence on the operating performance measures. None of the F values are significant for either the ESOP or the control sample. The regression coefficients after eight lags are, however, positive and significant for the ESOP firms. For the operating income dependent variable equation, b₈ is 0.865 (t-statistic = 2.59); for the operating income per employee dependent variable equation, b₈ is 0.833 (t-statistic = 2.44). For the control firms, not a single coefficient is significant.

Panel B presents 1-, 4-, 8-, and 12-quarter ahead forecast error variance (FEV) of change in operating performance attributable to a unit standard deviation shock in change in stock price. We find that a shock in stock price results in small variations in operating performance after one quarter for both ESOP and control firms. The variations increase over time, however. After 12 quarters, there are 36.1 percent and 17.2 percent variations in operating income for ESOP and control firms, respec-

tively. After 12 quarters, variation in operating income per employee due to a shock in stock price changes for the ESOP firms is slightly less than that of the control firms. The variations in operating income per employee are 30.2 percent for the ESOP firms and 33.4 percent for the control firms

Figures 9 and 10 display the direction and magnitude of the impact of the innovations in stock price on operating performance using impulse analysis. We shock the stock price variable by one standard deviation and calculate the operating performance's response to this impulse over a period of 12 months. As expected, both graphs show higher response of operating performance for the ESOP firms when compared to the control firms. The responses for the ESOP firms seem to be positive and stronger after eight quarters, suggesting a long-term impact of stock price on ESOP firms' operating performance.

Table 4—Results of Granger Causality Tests with Causality from Operating Performance to Stock Price and Variance Decompositions for the Total Samples of ESOP and Control Firms

Panel A: Granger Causality Findings

	Dependent Variable - Operating Income		Dependent Variable - Operating Income Per Employee	
	ESOP Sample	Control Sample	ESOP Sample	Control Sample
F	-0.015 (-0.11)	-0.005 (-0.04)	-0.034 (-0.23)	-0.034 (-0.27)
b ₁	-0.058 (-0.42)	-0.145 (-1.34)	-0.077 (-0.52)	-0.162 (-1.52)
b ₂	0.018 (0.14)	0.042 (0.34)	-0.015 (-0.11)	0.009 (0.08)
b ₃	0.125 (0.99)	0.076 (0.65)	0.097 (0.73)	0.045 (0.39)
b ₄	0.038 (0.30)	0.033 (0.33)	-0.004 (-0.03)	0.009 (0.10)
b ₅	-0.044 (-0.35)	0.067 (0.69)	-0.077 (-0.58)	0.051 (0.53)
b ₆	-0.226 (-1.79)*	-0.052 (-0.62)	-0.242 (-1.82)*	-0.066 (-0.81)
b ₇	-0.054 (-0.42)	0.008 (0.10)	-0.066 (-0.50)	-0.004 (0.54)
b ₈				

Panel B: Variance Decomposition Findings

Quarter Ahead	Variations in Stock Return Due to a Shock in Operating Income				Variations in Stock Return Due to a Shock in Operating Income Per Employee			
	ESOP Sample		Control Sample		ESOP Sample		Control Sample	
	SE	FEV	SE	FEV	SE	FEV	SE	FEV
1	0.051	0.0	0.042	0.0	0.051	0.0	0.056	0.0
4	0.056	0.7	0.043	4.7	0.057	1.5	0.067	4.9
8	0.060	8.4	0.044	7.8	0.062	10.9	0.074	7.5
12	0.061	9.7	0.044	8.2	0.063	13.9	0.085	7.9

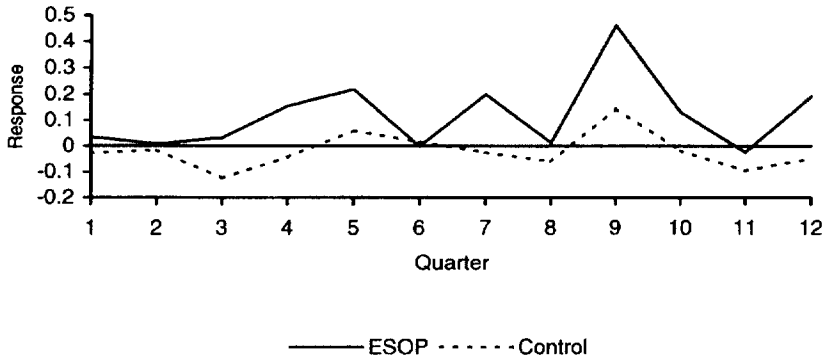
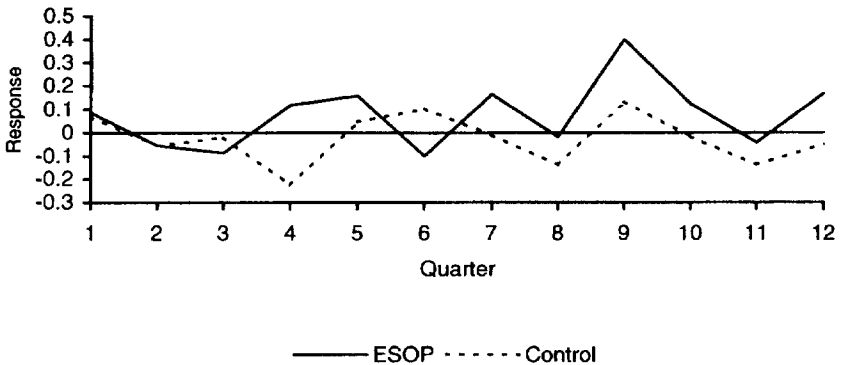
SE = Standard error of forecast, FEV = Forecast error variance of operating performance variable due to a shock in stock return

*** Significant at the 1 percent level

** Significant at the 5 percent level

* Significant at the 10 percent level

Panel A reports F-statistics and the coefficient values (t-value in parentheses). Panel B provides the forecast error variance (FEV) and the standard error of forecast (SE)

Figure 9—Response of Income**Figure 10—Response of Income/Employee**

The results of the Granger causality tests with causality from operating performance to stock price and the variance decompositions are displayed in Table 4. In Panel A, none of the F-statistics are significant, indicating absence of causality from performance to stock price. The variance decompositions in reported in Panel B show small variations in stock prices due to innovations in operating performance. Given that the financial markets are efficient, it is not unusual to observe insignificant relationship between firm performance and subsequent stock prices.

Findings for Smaller Samples Based on Change in Stock Price

Table 5 presents VAR results for the largest-increase, moderate-increase, and largest-decrease samples defined earlier. In Panel A we report significant F values for the largest-increase and largest-decrease ESOP firms. In the largest-increase category, F value is 2.57 when the dependent variable is operating income and the F value is 3.63 when the dependent variable is operating income per employee. The

Table 5—Results of Granger Causality Tests With Causality From Stock Price to Operating Performance and Variance Decompositions for the Subsamples of ESOP and Control Firms

Panel A Granger Causality Findings

Dependent Variable - Operating Income

	Largest-Increase		Moderate-Increase		Largest-Decrease	
	ESOP	Control	ESOP	Control	ESOP	Control
F	2.57**	0.98	0.65	1.55	2.58**	0.84
b ₁	0.32 (0.68)	-0.14 (-0.92)	-0.06 (-0.23)	0.50 (0.74)	0.05 (0.09)	-0.44 (-0.93)
b ₂	-0.24 (-0.58)	0.15 (0.86)	0.13 (0.46)	0.25 (0.36)	0.23 (0.45)	-0.78 (-1.51)
b ₃	-0.52 (-1.23)	-0.20 (-1.20)	0.45 (1.42)	-1.53 (-2.19)**	0.19 (0.37)	0.02 (0.04)
b ₄	-0.45 (-0.95)	-0.10 (-0.53)	-0.08 (-0.21)	0.06 (0.08)	-0.27 (-0.49)	0.47 (0.95)
b ₅	-0.27 (-0.58)	-0.23 (-1.25)	0.24 (0.65)	-1.09 (-1.48)	0.15 (0.31)	1.00 (1.98)*
b ₆	1.21 (2.75)**	-0.15 (-0.87)	-0.04 (-0.11)	0.31 (0.41)	-1.88 (-3.92)***	-0.14 (-0.28)
b ₇	-0.15 (-0.31)	0.08 (0.46)	-0.07 (-0.23)	-1.56 (-2.24)**	0.60 (0.95)	0.15 (0.31)
b ₈	1.27 (2.65)**	0.13 (0.78)	-0.08 (-0.24)	0.93 (1.27)	-0.80 (-1.57)	-0.27 (-0.56)

Dependent Variable - Operating Income Per Employee

	Largest-Increase		Moderate-Increase		Largest-Decrease	
	ESOP	Control	ESOP	Control	ESOP	Control
F	3.63***	0.76	0.69	1.71	2.42**	0.75
b ₁	0.47 (1.09)	0.12 (0.39)	-0.09 (-0.32)	0.43 (0.68)	-0.03 (-0.09)	-0.43 (-0.83)
b ₂	-0.22 (-0.59)	0.16 (0.51)	0.10 (0.36)	0.32 (0.48)	0.18 (0.35)	-0.79 (-1.42)
b ₃	-0.52 (-1.31)	0.02 (0.06)	0.47 (1.53)	-1.54 (-2.35)**	0.09 (0.18)	-0.38 (-0.68)
b ₄	-0.52 (-1.19)	-0.42 (-1.22)	-0.06 (-0.17)	0.01 (0.02)	-0.16 (-0.32)	0.53 (1.00)
b ₅	-0.39 (-0.93)	-0.04 (-0.11)	0.25 (0.68)	-0.98 (-1.42)	0.19 (0.37)	0.94 (1.69)
b ₆	1.43 (3.63)***	-0.07 (-0.21)	0.01 (0.00)	0.36 (0.50)	-1.92 (-3.88)***	-0.00 (-0.00)
b ₇	-0.05 (-0.12)	0.26 (0.82)	-0.02 (-0.05)	-1.55 (-2.40)**	0.55 (0.84)	-0.09 (-0.17)
b ₈	1.24 (3.19)**	-0.08 (-0.26)	-0.01 (-0.03)	0.89 (1.29)	-0.77 (-1.47)	-0.42 (-0.80)

Table 5 (cont.)—Results of Granger Causality Tests With Causality From Stock Price to Operating Performance and Variance Decompositions for the Subsamples of ESOP and Control Firms

Panel B: Variance Decomposition Findings																					
Variations in Operating Income Due to a Shock in Stock Return																					
	Largest-Increase			Control			ESOP			Moderate-Increase			Control			ESOP			Largest-Decrease		
	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	
1	0.171	0.1	0.040	2.5	0.058	1.8	0.194	0.1	0.302	5.6	0.211	6.7									
4	0.185	12.2	0.045	12.4	0.066	13.4	0.248	17.2	0.305	6.8	0.269	9.6									
8	0.227	39.9	0.049	20.0	0.077	19.9	0.277	28.5	0.377	38.4	0.326	15.2									
12	0.259	51.0	0.051	24.1	0.099	21.6	0.291	33.6	0.399	40.4	0.339	15.6									
Variations in Operating Income Per Employee Due to a Shock in Stock Return																					
	Largest-Increase			Control			ESOP			Moderate-Increase			Control			ESOP			Largest-Decrease		
	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	SE	FEV	
1	0.181	0.1	0.075	1.2	0.055	2.6	0.182	0.4	0.312	6.7	0.232	1.8									
4	0.195	12.9	0.099	10.9	0.064	16.4	0.240	20.1	0.313	7.1	0.339	4.5									
8	0.246	45.0	0.133	10.5	0.075	23.4	0.272	31.7	0.387	37.8	0.530	12.8									
12	0.275	52.4	0.180	8.0	0.098	25.0	0.287	36.7	0.407	39.4	0.679	14.5									

SE = Standard error of forecast, FEV = Forecast error variance of operating performance variable due to a shock in stock return

*** Significant at the 1 percent level

** Significant at the 5 percent level

* Significant at the 10 percent level

Panel A reports F-statistics and the coefficient values (t-value in parentheses). Panel B provides the forecast error variance (FEV) and the standard error of forecast (SE)

coefficient values are positive and significant at lag six and lag eight. $b_6 = 1.21$ (t-statistic = 2.75) and $b_8 = 1.27$ (t-statistic = 2.65) in the operating income equation and $b_6 = 1.43$ (t-statistic = 3.63) and $b_8 = 1.24$ (t-statistic = 3.19) in the operating income per employee equation. These findings indicate that performance of ESOP firms improves when their stock prices rise substantially.

In the largest-decrease ESOP sample, the F values are also significant. The F value is 2.58 when the dependent variable is operating income. The F value is 2.42 when the dependent variable is operating income per employee. The coefficients for lag six are negative and significant, $b_6 = -1.88$ (t-statistic = -3.92) when the dependent variable is operating income and $b_6 = -1.92$ (t-statistic = -3.88) when the dependent variable is operating income per employee. The negative sign of the coefficients suggests that the performance of ESOP firms improves when their stock prices fall. Moderate increases in stock prices do not show significant relationship with operating performance for the ESOP sample.

Overall, the findings for the largest-increase sample are consistent with our hypothesis that ESOP firms' operating performance improves due to changes in stock price. The negative regression coefficients for the largest-decrease ESOP category are anomalous, suggesting that firm performance improves after stock prices fall.

Panel B provides variance decomposition findings. In general, variations in firm performance are small after the first quarter and increase through the twelfth quarter. In the largest-increase group, the ESOP firms exhibit higher variations than the control firms. After the twelfth quarter, variations in operating income are 51.0 percent for ESOP firms and 24.1 percent for control firms. Variations in operating income per employee for the same forecast period are 52.4 percent for ESOP firms and only 8.0 percent for control firms.

In the largest-decrease category, ESOP firms also show higher variations in operating performance after the twelfth quarter. Variations in operating income are 40.4 percent for ESOP firms and 15.6 percent for control firms, while variations in operating income per employee are 39.4 percent for ESOP firms and 14.5 percent for control firms.

ESOP firms with modest changes in stock prices have smaller variations in operating performance when compared to the control firms and when compared to the largest-increase and largest-decrease ESOP firms. Firms in the moderate-increase category seem unable to capitalize on the operating efficiency gains that result from employee ownership.

Results of the impulse responses for the three categories are graphed in Figures 11, 12, and 13. Each response is standardized by the standard error of estimate. Because both our operating performance measures display similar results, we report impulse responses of the operating income only. Figure 11 shows that, in the largest price increase category, the ESOP firms show stronger and more positive responses

in operating income when compared to the control firms. Results for the largest decrease category in Figure 12 show that the ESOP firms have stronger and more negative responses when compared to the control firms. In both Figures 11 and 12, the responses for the ESOP firms appear to be noticeable after six quarters. The results for the moderate-change category given in Figure 13 show that both the ESOP and the control firms have similar impacts on operating income due to a shock in stock price change.

Figure 11—Response of Income in Largest-Increase Category

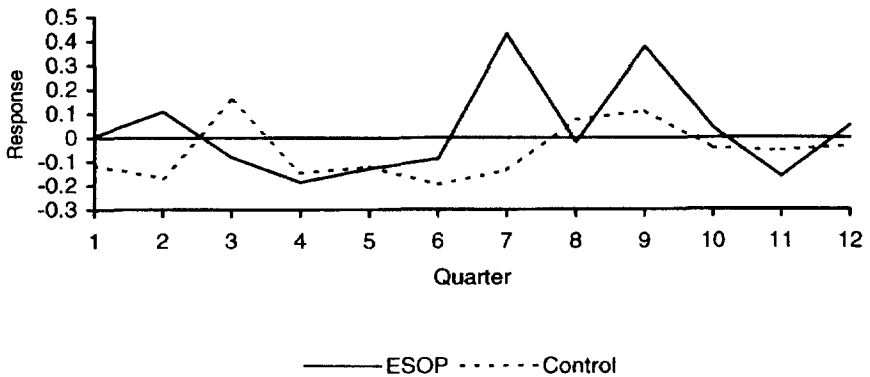


Figure 12—Response of Income in Largest-Decrease Category

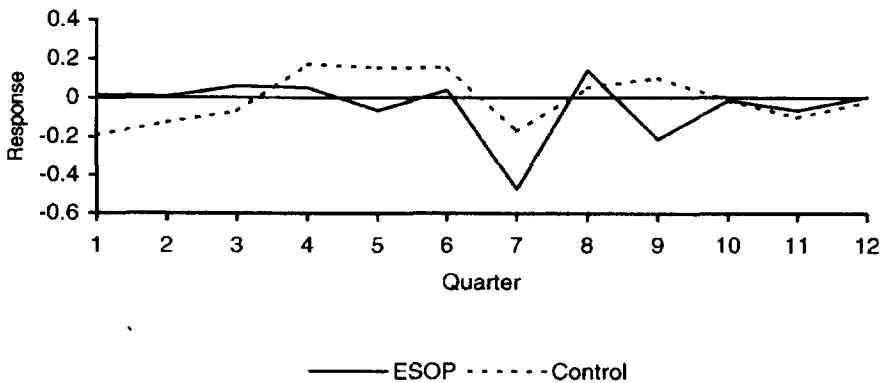
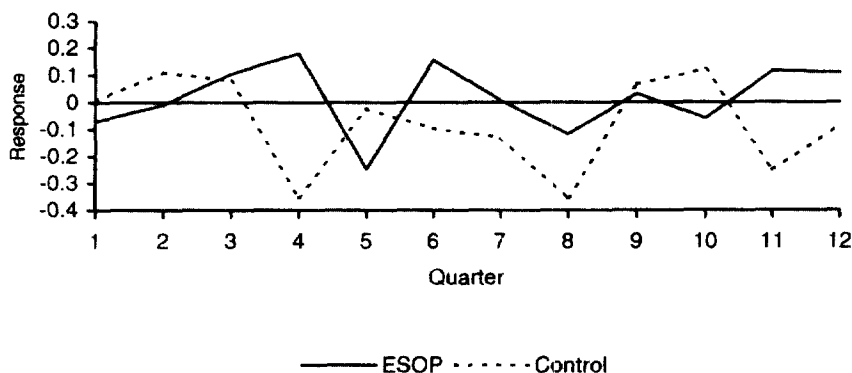


Figure 13—Response of Income in Moderate-Increase Category

Findings on ESOPs Adopted after the 1986 Tax Reform Act

One of the reasons for the growth of ESOPs in the late 1980s was the passage of the Tax Reform Act of 1986, which added new tax benefits to the sponsoring firms. The 1986 tax law extends tax deductions to dividends used to repay ESOP loans, allows mutual funds to exclude 50 percent of the interest earned on ESOP loans from taxable income, and exempts the 10 percent excise tax on reversions from defined benefit pension plans that are transferred to an ESOP. (This provision was repealed by the 1989 act.) Because more than half of our sample firms adopted ESOPs after the passage of the Tax Reform Act of 1986, our sample could be skewed because of these tax-related changes. To address this, we re-examine the relationships between stock price and subsequent operating performance of firms that adopted ESOPs in 1987 and 1988. The results (not reported) are similar to those reported for the full ESOP sample in Table 3. We find positive and significant regression coefficients for lag eight (b_8) suggesting higher changes in stock prices result in higher changes in operating performance after eight quarters. The variations in operating income and operating income per employee are also high in quarter 12 (28.9 percent variation for operating income and 27.8 percent variation for operating income per employee).

Conclusions

The literature on employee ownership posits that financial benefits provide a link between employee ownership and employee commitment to the firm. Employees are likely to be more productive as the value of their ownership accounts increases. This suggests that the price movements of the company stock can impact employee productivity and operating performance.

In this paper, we take the perspective that stock returns and subsequent operating performance of the ESOP firms are positively related. Higher (lower) stock returns will enhance (reduce) employee commitment and productivity, which, in

turn, will improve (lower) operating performance. Using aggregate data, we find evidence of associations between changes in stock prices and changes in operating performance of the ESOP firms. The Granger causality tests detect causality from stock price to operating performance for ESOP firms that have large increases in stock price or large decreases in stock prices. Modest changes in stock prices do not seem to impact operating performance. The stock price-performance relationship for the largest-increase category is positive, suggesting that firm performance improves after stock prices increase. Contrary to our expectation, the relationship in the largest-decrease category is negative, indicating that firm performance improves when stock prices decrease. The findings of our study also indicate that the relationship between stock price and subsequent operating performance of ESOP firms is noticeable over a longer horizon. The coefficients of the regression equations and the variations and impulse responses of operating performance appear to be significant several quarters after the changes in stock prices occur.

Our empirical evidence implies that employee ownership in itself may not be enough to improve firm performance. Rather, ownership has a positive impact on a firm's operating performance when there are significant changes in stock prices. This study provides new information to corporate planners and public policy makers in their understanding of ESOP firm performance.

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