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Employee Stock Ownership Incentives and Contracting Efficiency, with Evidence from
Employee Stock Ownership Plan Adopters

John Peter Daley

A dissertation submitted in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy

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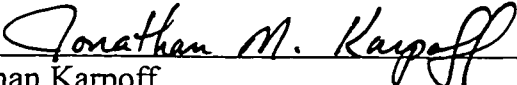
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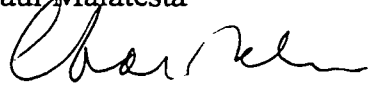


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Abstract

Employee Stock Ownership Incentives and Contracting Efficiency, with Evidence from
Employee Stock Ownership Plan Adopters

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This dissertation develops a microeconomic rationale for the use of broad-based stock incentives in the presence of a central monitor. I show that the ability of stock to align owner and employee interests is a function of marginal monitoring costs. The theory yields two pairs of refutable implications. First, the optimal level of individual employee ownership is negatively related to firm size and positively related to marginal monitoring costs. Second, the change in firm value attributable to employee stock ownership is positively related to both the level of individual employee ownership and marginal monitoring costs. I gather data from firms initiating Employee Stock Ownership Plans (ESOPs) during the years 1986 through 1991. I test the first pair of implications by regressing average individual employee ownership on a cross-section of firm attributes; the second pair by regressing the cumulative abnormal daily stock price returns realized when an ESOP is announced on a cross-section of firm attributes. Finally I perform multinomial logit regressions on panel data to estimate the effects of changes in a cross-section of firm attributes on the likelihood of adopting a leveraged or nonleveraged ESOP. The strongest support for my theory comes from the first test. Average employee ownership is positively related to marginal monitoring costs and negatively related to firm size. The theory receives additional though weaker support from the second test. Cumulative abnormal returns associated with ESOP announcements are positively related to some proxies for marginal monitoring costs for both types of ESOPs but not to average employee ownership, with the statistical significance of the relationships dependent upon model specification. The third test provides minimal support for the theory. The likelihood of adopting a leveraged ESOP is positively related to increases in only one of the four proxies for marginal monitoring costs. The likelihood of adopting a nonleveraged ESOP exhibits no relationship to changes in any proxy for marginal monitoring costs.

TABLE OF CONTENTS

	Page
List of Figures	iii
List of Tables	iv
Chapter 1: Introduction	1
Chapter 2: Literature Review and Institutional Background	
2.1 Incentive effects of employee stock ownership	5
2.2 Institutional background	9
2.3 Other motivations underlying ESOP adoption	11
2.4 Summary	19
Chapter 3: Stock Ownership Incentives	
3.1 Introduction	29
3.2 Assumptions and definitions	31
3.3 Equilibrium compensation bundles	34
3.4 Shirking and employee stock ownership	48
3.5 The owner-manager's choice	58
3.6 Factors that affect firm value	63
3.7 Capturing employee surplus	65
3.8 Stock ownership as a response to disequilibria	66
3.9 Employee ownership when employees are risk averse	67
3.10 Summary	68
Chapter 4: Sampling procedure, variables, and descriptive statistics	
4.1 Sample selection	79
4.2 Variables	81
4.3 Descriptive statistics	86

TABLE OF CONTENTS, CONTINUED

	Page
Chapter 5: Factors affecting the ESOP decision	
5.1 The multinomial logit model	95
5.2 The tests	97
5.3 Multinomial logit regression results	99
5.4 Binary logit regression results	101
5.5 Summary	103
Chapter 6: Cross-sectional regressions on average employee ownership	
6.1 Factors affecting average employee ownership	116
6.2 Differences between leveraged and nonleveraged ESOP adopters	118
6.3 Summary	119
Chapter 7: ESOP wealth effects	
7.1 Event study methods	123
7.2 Event study results	129
7.3 Cross-sectional regressions on pooled data	132
7.4 Wealth effects by the type of ESOP adopted	136
7.5 Summary	139
Chapter 8: Summary	156
Bibliography	162
Appendix 1: Relaxing the full-value tax shield assumption	167
Appendix 2: Mathematical derivations	169
Appendix 3: Employee stock ownership when employees are risk averse	174
Appendix 4: Fitting the multinomial logit model	180
Appendix 5: Sensitivity of regression results to inclusion of an independent deflator variable	184

LIST OF FIGURES

Number	Page
1a.	The market price of labor when monitoring is costless and perfect 70
1b.	The compensation bundle when monitoring is costless and perfect70
2.	Monitoring cost function 71
3.	Net marginal revenue constraint 72
4a.	The market price of labor when monitoring is costly and perfect73
4b.	The compensation bundle when monitoring is costly and perfect73
5.	The shift in a monitoring cost function induced by the ability to shirk74
6.	The shift in the net marginal revenue constraint induced by shirking75
7a.	The market price of labor when monitoring is costly and imperfect76
7b.	The compensation bundle when monitoring is costly and imperfect77
8.	The effect of stock ownership on shirking 77
9.	The optimal compensation bundle with stock ownership 78

LIST OF TABLES

Number	Page
1.	Selected results from previous studies using logistic regressions 22
2.	Selected results of previous cross-sectional regressions on the cumulative abnormal returns 24
3.	Selected results from previous event studies 27
4.	Definitions and formulas of test variables 88
5.	Descriptive statistics 90
6.	Results from multinomial logit regressions 104
7.	Results from binary logit regressions 112
8.	Results from regressing the average increase in fractional employee ownership created by a new or significant addition to an existing ESOP on a cross section of firm characteristics 120
9.	Distribution by industry and firm size for 87 firms that adopt ESOPs between 1986 and 1991 141

LIST OF TABLES, CONTINUED

Number	Page
10. Average abnormal daily stock price returns for 87 firms around the date that the decision to adopt an ESOP is announced	142
11. Cumulative average abnormal daily stock price returns for 87 firms around the date that the decision to adopt an ESOP is announced	144
12. Cumulative average 2- and 3-day abnormal daily stock price returns by sample segment around the date that the decision to adopt an ESOP is announced	145
13. Results from regressing 3-day cumulative abnormal returns on a pooled cross-section of level data	147
14. Results from regressing 3-day cumulative abnormal returns on a cross section of level data, separate leveraged and nonleveraged effects	150
15. Summary of predictions and results from multinomial and cross-sectional regressions	160

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DEDICATION

I dedicate this research to Cynthia—my muse, my life, my wife. And to my parents and grandparents who instilled the joy of learning in their children and grandchildren. Though physically absent from this earth for too many years, their legacy remains.

Chapter 1

1 Introduction

Neoclassical price theory implies that the incentive effects produced by broad-based employee stock ownership compensation plans will be overwhelmed by the problem of free riding. When an incentive is divided among n employees, each employee bears the full cost of any additional individual effort but receives only $1/n$ of its value (e.g., see Bhagat, Brickley, and Lease [1985], FitzRoy and Kraft [1987]). Hence, "... the idea that joint ownership can do much for incentives when the number of workers is large seems wrong on the face of it" (Kandel and Lazear [1992]).

Nevertheless, directors are advised that stock ownership aligns employee and owner interests (Rutledge [1996]) and stock-based group incentives are an increasingly common practice. The number of firms offering stock ownership plans has grown markedly since the mid 1960s, nationally and internationally (Jones and Kato [1995], Wysocki [1995]). One recent poll finds 66 percent of responding companies offer company stock as a 401(k) option (Richardson [1995]). Another finds 54 percent of Fortune 1000 companies offer some kind of employee ownership program (NCEO [1996]). In addition, empirical evidence supports a positive link between profit-sharing and productivity and, to a lesser degree, between employee share ownership and productivity (Beatty [1995], Blasi, Conte, and Kruse [1996], Cahuc and Dormont [1997], Conte and Svejnar [1990], FitzRoy and Kraft [1987], Jones and Kato [1995], Kruse [1992], Kumbhakar and Dunbar [1993], and Weitzman and Kruse [1990]).¹

¹For literature reviews see Conte and Svejnar [1990] and Weitzman and Kruse [1990].

Peer pressure, mutual monitoring, alignment of employer and employee interests, employee self-selection, investment in firm-specific human capital, and monitoring and information costs are invoked to explain this apparent contradiction (Conte and Svejnar [1990], Weitzman and Kruse [1990]).² The free-rider problem also may be mitigated if the desired changes in employee behavior do not involve large personal costs (Brickley and Hevert [1991], Nalbantian [1987]). But much of the discussion on these points lacks focus and rigor (Lazear [1995]).

Recent work by Kandel and Lazear [1992], FitzRoy and Kraft [1995], Holmstrom [1982], and Cahuc and Dormont [1997] partially fill this void. These models examine cooperative behavior as enforced by peer pressure and mutual monitoring. Kandel and Lazear seek to explain it; FitzRoy and Kraft, Holmstrom, and Cahuc and Dormont assume its efficacy by invoking game theory. But these theories do not consider the effect of a central monitor on employees' relative prices for wages and shirking, as suggested by Alchian and Demsetz [1972], or the effect of these relative prices on employee behavior.

This dissertation develops a theory that subsumes much of the current thinking about stock-based group incentives without invoking peer pressure or mutual monitoring. I begin with Alchian and Demsetz' [1972] observation that costly and imperfect monitoring implies an equilibrium compensation package in which, at the margin, an employee values pecuniary compensation more than shirking. I then demonstrate that the employee's relative values for pecuniary compensation and shirking are functions of a firm's marginal monitoring costs. As marginal monitoring costs increase, the value of shirking relative to pecuniary compensation decreases, mitigating the free-rider problem.

²Game theory offers another possible explanation. The existence of multiple equilibria in a repeated prisoner's dilemma *may* defeat the free-rider problem (Weitzman and Kruse [1990] (emphasis theirs)).

The theory yields two pairs of refutable implications. First, the optimal level of individual ownership assigned to employees by owner-managers is negatively related to firm size and positively related to the marginal monitoring costs. Second, the change in firm value attributable to employee stock ownership is positively related to both the level of individual employee ownership and marginal monitoring costs.

To test these implications, I gather data from firms initiating Employee Stock Ownership Plans (ESOPs) from 1986 through 1991. Because ESOPs enable management to unilaterally make employees partial owners while simultaneously determining the level of partial ownership, firms that adopt them are well-suited for testing my theory.

Using ESOP data introduces other interesting dimensions to the empirical problem. Sponsoring an ESOP may be an attempt to reduce agency costs, but it may also be an attempt to capture special tax and financing benefits, increase managerial control without additional risk-bearing, or a combination of all three. Further complicating matters, ESOPs can be leveraged or nonleveraged, with tax and voting-control benefits accruing primarily to leveraged plans (Chaplinsky and Niehaus [1990], Scholes and Wolfson [1990]). Previous research does not consistently differentiate between leveraged and nonleveraged plans.³ So, though previous research supports the hypotheses that ESOPs are adopted to capture specialized tax and financing benefits and to concentrate voting control in managers' hands (Beatty [1994, 1995], Chang [1990], Chang and Mayers [1992], Chaplinsky and Niehaus [1994], Gordon and Pound [1990], Sokobin [1993]), the conclusions from these tests do not automatically apply to nonleveraged ESOPs. Therefore, this dissertation also considers the premise that leveraged and nonleveraged ESOPs serve different clienteles.

³Sokobin [1993] and Beatty [1994] are exceptions. Sokobin finds evidence of a clientele effect for tax credit versus tax deduction ESOPs. Tax credit ESOPs (TRASOPs) were phased out by Congress in 1986. Beatty considers factors affecting the likelihood of adopting leveraged ESOPs only.

I test the first pair of implications by regressing average individual employee ownership on a cross-section of firm attributes, and the second pair by regressing the cumulative abnormal stock price returns realized when an ESOP is announced on a cross-section of individual firm attributes. In addition, I perform a multinomial logit regression to estimate the effects of a cross-section of individual firm attributes on the likelihood of adopting a leveraged or nonleveraged ESOP. The tests control for the type of ESOP adopted, thereby facilitating tests for ESOP clientele effects.

The results provide only mixed support for my theory. As predicted, average employee ownership is negatively related to firm size and positively related to marginal monitoring costs; cumulative abnormal returns associated with ESOP announcements are positively related to average employee ownership for leveraged plans and to marginal monitoring costs for both types of plans; and the likelihood of adopting a leveraged ESOP is positively related to marginal monitoring costs. But the statistical significance of many of the relationships is weak and sensitive to model specification.

The premise that leveraged and nonleveraged ESOPs serve different clienteles receives robust support from all three tests. The effects of factors that explain the level of average employee ownership conferred by, the wealth effects from, and the presence of leveraged and nonleveraged ESOPs differ significantly.

The dissertation proceeds as follows. Chapter 2 provides a brief institutional background, reviews pertinent literature, and develops hypotheses about the different motivations for leveraged and nonleveraged ESOPs. Chapter 3 develops a theory of employee stock ownership and its implications. Chapter 4 describes the sampling procedure and data. Chapters 5, 6, and 7 test the implications and report the results. Chapter 8 concludes.

Chapter 2

2 Literature review and institutional background

This chapter begins by reviewing current research on the incentive effects of employee stock ownership plans. It then presents a brief institutional background. This is followed by a review of ESOP tax, financing, and control effects, with emphasis on how these effects differ between leveraged and nonleveraged plans. Representative findings of previous empirical work, reported in Tables 1, 2, and 3, are discussed. The chapter concludes with a summary in the form of six propositions.

2.1 The incentive effects of employee stock ownership

Theoretical research. A wide range of explanations have been proffered for the apparent ability of group incentives to overcome the free-rider problem, including peer pressure and mutual monitoring, alignment of employee with employer interests, employee self-selection, investment in firm-specific human capital, and monitoring and information costs. Employee stock ownership may increase employee motivation, thereby stimulating work effort, initiative, and monitoring of peers and management. Productivity may be enhanced and profitability increased. (Bradley and Gelb [1985], Bruner [1988], Hansmann [1998], Nalbantian [1987])

In addition, if the employee behavior desired by the firm does not involve large personal costs to the employee, employees indifferent between the desired behavior and inaction may be motivated. For example, day-to-day employees may be better able to observe inefficiencies in a production process. Under pure wage or individual performance compensation plans, employees have no incentive to share such information. Since the cost of sharing information is small, group incentives might be enough to

encourage such behavior, especially if positive externalities exist. (FitzRoy and Kraft [1995], Kandel and Lazear [1992], Nalbantian [1987]) It follows that if employee behavior influences firm value, and if that behavior is either unobservable or prohibitively costly to monitor, it makes sense for employees to bear risk associated with firm value (Chen and Kensinger [1988]).

Psychology and sociology experiments suggest additional factors that might mitigate the free-rider problem. The level of cooperation in a group has been found to increase with group identification and the level of profits going to the group. An ESOP may foster such group identification. The prospect theory, that argues individuals tend to overweight small probabilities in their decision making, also has received some support. A small holding of stock may provide a greater incentive than would be anticipated otherwise. (Brickley and Hevert [1991])

Though, as previously noted, much of the discussion on these points has lacked focus and rigor (Lazear [1995]), rigorous efforts have been made. Holmstrom [1982] demonstrates that a bonus can be an incentive for a team if it is conditional on a production target and administered by an outside party. Extending Holmstrom's model, Cahuc and Dormont [1997] show that effort and labor productivity are increasing functions of the size of the bonus. FitzRoy and Kraft [1995], comparing the effects of individual versus group incentives on an employee's contribution to firm profit, demonstrate that group incentives can be effective motivators when the cost of observation is close enough to mean productivity. But all three papers assume what a referee for Cahuc and Dormont terms "the most optimistic view of the possibility of team work in a non-cooperative game."

Kandel and Lazear [1992] investigate how peer pressure operates in partnerships by examining the interactions between profit sharing, shame, guilt, norms, mutual monitoring, and empathy. They consider the conditions under which peer pressure mitigates the free-rider problem in small groups. But because they consider behavior in partnerships, Kandel and Lazear's model encompasses neither the role of a monitor nor the effect of monitoring on the interaction between the costs and benefits of individual effort.

While each of these approaches is similar in some aspect to my work, all rely on the effectiveness of peer pressure and none explicitly recognizes the value of on-the-job consumption to employees or the tradeoffs between wages and on-the-job consumption noted by Alchian and Demsetz [1972] and Demsetz [1983]. Nor is any of the models structured to yield implications concerning the interaction between monitoring and employee preferences for wages and on-the-job consumption, the core contribution of this research.

Empirical research. Though there has been much empirical work on the affect employee stock ownership has on productivity (Blasi, Conte, and Kruse [1996], FitzRoy and Kraft [1987, 1995], Jones and Kato [1995], Kruse [1992]), corporate control (Chang and Mayers [1992], Chaplinsky and Niehaus [1994], Chaplinsky, Niehaus, and Van de Gucht [1998], Gordon and Pound [1990]), and taxes and financing (Beatty [1994, 1995], Chaplinsky and Niehaus [1990], Dhillon and Ramierz [1994], Sokobin [1993]), empirical work on the role of employee incentives in motivating ESOPs and explaining investor reaction to their announcements is limited.

Two studies examine the relationship between the likelihood of adopting an ESOP and the incentives created by employee stock ownership (Table 1, panel *a*). Beatty

[1994] uses systematic and nonsystematic risk to proxy for the effect of stock incentives on the likelihood of adopting a leveraged ESOP. She reasons that because stock ownership forces employees to bear increased levels of unsystematic risk, unsystematic risk will be negatively related to employee incentives and therefore negatively related to the likelihood of adoption. And because a high level of systematic risk exacerbates moral hazard problems, she reasons that it will be positively related to employee incentives and the likelihood of adoption. Beatty finds both variables significantly related to the likelihood of adopting a leveraged ESOP with the predicted signs. But these proxies may not fully or unambiguously capture employee incentive effects. For example, risk may also decrease the expected value of ESOP tax shields.

Kruse [1996] uses the number of employees, capital intensity (the ratio of capital to employees), research and development intensity (the ratio of research and development expense to sales), and the changes in these variables to proxy for productivity-related reasons for adopting ESOPs. He finds a positive relationship between the presence of an ESOP and two of his proxies, the number of employees and capital intensity, but no relationship between the decision to adopt and changes in any of the three variables. Kruse concludes that his proxies partially explain the presence of, but not the decision to adopt, an ESOP.

Only one study considers the cross-sectional incentive effects of ESOPs on the market's reaction to ESOP announcements. Beatty [1995] argues that a positive relationship between cumulative abnormal returns and the amount of ESOP benefits is consistent with the market attributing a productivity effect to ESOPs. Beatty finds such a relationship, but only when the ESOP does not replace an existing benefit plan.

Absent a rigorous theory it is difficult to identify variables that capture incentive effects. Nor does any existing theory provide a framework that unifies the many proffered explanations for the efficacy of employee stock ownership incentives. In Chapter 3 I develop a theory that begins the unification process.

To the extent that employee stock ownership plans motivate employees, there is no reason to expect a difference in the motivation provided by leveraged and nonleveraged plans beyond the level of ownership conferred on employees by the plan. If employee stock ownership increases employees' incentives to work harder, then proxies for incentive effects will be positively related to the likelihood of adopting either type of ESOP and to the abnormal returns realized when the decision is announced.

ESOP tax and financing benefits and control-related effects, however, produce different implications for leveraged and nonleveraged plans. Following a brief institutional background, I review ESOP tax, financing, and control-related effects as they apply to leveraged and nonleveraged plans.

2.2 Institutional background

Employee Stock Ownership Plans are tax-qualified deferred employee benefit plans intended to promote a broader capital ownership base. They can be initiated in lieu of or in addition to existing deferred compensation plans, including other ESOPs. They can be structured as either pure stock bonus plans or combination money purchase and stock bonus plans. Two features distinguish ESOPs from other types of stock bonus or profit-sharing plans: they are mandated to invest primarily in securities of their sponsoring firm (interpreted to mean more than 50% of total plan assets); and they can

engage in less than arm's length financial transactions with their sponsoring firms, e.g., they can accept loans and purchase stock from their sponsoring firms.⁴

2.2.1 Simple Stock Bonus Plan

In its simplest form an ESOP is a tax-qualified stock bonus plan. Contributions are made either in company stock or in cash that is then used to purchase company stock. The stock is placed in a trust and allocated to individual participant accounts following a formula set forth in the ESOP's documents. The company deducts the value of the contribution from its pre-tax earnings. Vested shares are distributed upon retirement or termination. Because ESOPs are exempted from the diversification requirement in the Employee Retirement Income Security Act of 1974 (ERISA), they can accept ongoing stock contributions.

2.2.2 Simple Leveraged ESOP

A leveraged ESOP uses borrowed money to purchase employer stock. First, an employee stock ownership trust (ESOT) is established. The trust then secures a loan from an outside lender that is guaranteed by the sponsoring firm. Alternatively, the sponsoring firm borrows the funds and re-lends them to the trust. The trust then purchases shares of the sponsoring firm's stock either from the sponsor itself or on the open market. The sponsor makes regular contributions to the trust to service the debt. As the principal is retired, shares of equal value are allocated to participants following a formula set forth in the ESOP's documents. Tax treatment of the interest expense is identical to that for other debt. The portion of the contribution going towards principal is

⁴The reader is referred to Kalish [1989] for a comprehensive treatment of institutional details.

treated as employee compensation expense and deducted from pre-tax earnings. The debt appears on the sponsoring firm's balance sheet, with a contra account for equity.

Several accounting changes were made in 1994. Previously, all shares, whether allocated or unallocated, were included in the earnings per share calculations. Now only allocated shares are used. Prior to 1994, dividends paid to ESOP shares were charged to retained earnings. Now, dividends paid to allocated shares are charged to retained earnings; those paid to unallocated shares to current earnings. The deduction for principal payments was formerly based on the original purchase price of the stock. For publicly traded corporations, it is now the market value of the shares when allocated. These changes take place outside of the time period for this study. (NCEO [1994b])

2.3 Other motivations underlying ESOP adoption

In addition to motivating employees (what I shall refer to as the incentive hypothesis), ESOPs provide unique tax and financing benefits (tax hypothesis) and enhance insider control (control hypothesis). Previous tests of these hypotheses include logistic regressions, event studies, and regressions of announcement period cumulative abnormal returns on a cross-section of individual firm attributes. I now review current research examining these motivations.

2.3.1 Tax effects

To encourage ESOP adoptions, Congress enacted a series of purportedly unique tax and financing benefits for sponsoring firms. Beginning with ERISA in 1974, sponsoring firms can deduct both principal and interest payments on ESOP debt. The value of the principal deduction has been subject to much debate. ESOP proponents claim ESOP financing is cheaper than other types of debt because both interest and

principal payments are deductible (e.g., Frisch [1982]). But the savings are illusory. The deduction for principal payments is simply a deduction for employee compensation (Chaplinsky and Niehaus [1990], Freiman [1990]). And the cash flows to pre-1984 leveraged and nonleveraged ESOPs can be replicated using common stock, debt, and existing tax-qualified deferred compensation plans (Johnson, Pratt, and Stewart [1982]).⁵

The first real financial benefits for ESOP adopters were contained in the 1984 Deficit Reduction Act. First, qualified lenders could exclude from taxation 50 percent of the interest income earned on loans to ESOPs, provided loan proceeds were used to purchase the sponsoring firm's securities. This resulted in ESOP lending rates approximately 10 to 15 percent lower than other comparable debt (Shackelford [1991], NCEO [1994b]). Second, dividends paid to ESOP shares and passed through to plan participants were made deductible.

The 1986 Tax Reform Act further increased the value of ESOP tax shields, but primarily for leveraged plans. Dividends paid to unallocated shares and used to retire the principal on security acquisition loans were made deductible over and above the 25 percent contribution limit imposed by section 415 of the Internal Revenue Code. Also, the number of lenders eligible for the interest income exclusion was increased. More generally applicable, ESOPs were exempted from certain restrictions on transferring net-operating-loss carryforwards with ownership changes and from a 10 percent excise tax on excess funds from terminated defined benefit plans (reversions) if the reversions were rolled into an ESOP.⁶

⁵The reader is referred to Conte and Svejnar [1990] for a thorough treatment of the financing cost debate.

⁶This last benefit, which expired December 31, 1988, appears to have had limited appeal. Few firms availed themselves of the exemption. Scholes and Wolfson [1990] list four, but do not claim an exhaustive search. I found ten.

The 1989 Omnibus Budget Reconciliation Act maintained past dividend treatment but restricted the interest income exclusion to loans to ESOPs owning more than 50 percent of their sponsoring firm's securities. This severely limited the number of firms able to benefit from the exclusion. In 1996 the interest income exclusion was eliminated altogether.

ESOP tax and financing benefits derive from the dividend deduction and interest income exclusion, though some disagreement exists as to the precise source and size of the benefits. Scholes and Wolfson [1990] observe that using dividends on unallocated shares to pay down an ESOP loan produces a marginal tax deduction equal to the dividends. However, Freiman [1990] asserts that this deduction exists only for dividends paid to allocated ESOP shares. Chaplinsky and Niehaus [1990] show that marginal ESOP financial effects are a function of the interest income exclusion and dividends paid to all ESOP shares. Prior to the 1994 changes, these benefits came at a cost. Because each year's tax deduction was based upon the market value of the shares at the time they were placed in the ESOP, future tax deductions failed to reflect any increased share value (Beatty [1994, 1995], Freiman [1990]). This resulted in a loss of future tax deductions for leveraged ESOPs relative to other types of qualified plans.

Evidence supporting the existence of ESOP tax effects is mixed (panels *b*, Tables 1 and 2). Beatty [1994] uses the presence of a net-operating-loss carryforward and dividend yield to proxy for ESOP tax effects on the likelihood of adopting an ESOP. She argues that firms with no tax liability will be unable to capitalize on, and dividends are an integral part of, ESOP tax shields. Supporting the tax motivation hypothesis, she finds a statistically significant negative relationship between the likelihood of adopting a leveraged ESOP and the presence of a net operating loss. But she finds no significant relationship between the likelihood of adopting a leveraged ESOP and a firm's dividend

yield. Nor does Sokobin [1993] find any significant tax effects on the likelihood of adopting an ESOP after 1986.

Other studies measure the marginal effect of ESOP tax and financing benefits on the cumulative abnormal returns associated with ESOP announcements. Supporting the presence of these benefits, Beatty [1995] finds announcement period cumulative abnormal returns are positively related to the net present value of ESOP financial benefits. But Dhillon and Ramirez [1994] find a weak negative relationship between ESOP announcement period abnormal returns and firm marginal tax rates, opposite the predicted effect. Chang and Mayers [1992] do not measure tax effects explicitly, but find announcement period abnormal returns significantly and positively related to an indicator variable for leveraged ESOPs. This could reflect the value of either leveraged ESOP tax benefits or control effects.

ESOP tax and financing benefits do not accrue equally to leveraged and nonleveraged plans. The interest income exclusion and deduction for dividends used to service ESOP debt accrue exclusively to leveraged ESOPs. Only the deduction for dividends passed through to plan participants accrues to leveraged and nonleveraged plans alike. But few firms avail themselves of this benefit (Chaplinsky and Niehaus [1990]). Therefore, the ability to use additional tax shields should separate leveraged from nonleveraged plan adopters, both in predicting the likelihood of adoption and in explaining the stock price reaction when the decision to adopt is announced.

2.3.1a Earnings variability and the expected value of tax shields.

ESOPs, especially leveraged plans, generate a series of future tax deductions. To benefit from these deductions, firms must have taxable earnings. If variability in a firm's

operating environment reduces taxable earnings, it also reduces the expected value of ESOP tax shields.

Consider the following example. Let Es equal the tax deduction generated by a firm's ESOP. Let $EBEsT$ be a firm's earnings before taxes and any ESOP deduction, but after interest and depreciation. Assume $EBEsT$ is uniformly distributed over the interval $[a, b]$. Let τ equal a firm's marginal tax rate and E^* equal the minimum value of $EBEsT$ necessary to capture the full value of an ESOP's tax shields, τEs . Finally, let E_{min} equal the minimum earnings necessary for a firm to receive any benefit from the tax deduction, Es .

Assume owner-managers will incur the costs of initiating an ESOP only if they expect to capture the full value of the resulting tax shields. Then the expected value of the firm's earnings exposed to taxation after existing tax shields have been used ($E[EBEsT]$) must be greater than or equal to the minimum level of earnings necessary to capture the full value of the ESOP's tax shields (E^*).⁷ For $E^* \leq E[EBEsT]$, the expected value of the tax shields is

$$\begin{aligned} E[TS|I_{(a,b)}] &= \int_{E_{min}}^{E^*} \tau(x - Es) \frac{1}{b-a} dx + \int_{E^*}^b \tau Es \frac{1}{b-a} dx \\ &= \frac{\tau}{b-a} \left[\frac{E^{*2} - E_{min}^2}{2} \right] - \frac{\tau Es}{b-a} (E^* - E_{min}) + \frac{1}{2} \tau Es. \end{aligned}$$

Now let the variance of a firm's earnings increase symmetrically to the interval $[a', b']$, where $a' < a$, $b' > b$, and $a - a' = b' - b$. The expected value of the tax shields becomes

⁷The assumption of $E^* \leq E[EBEsT]$ is stronger than necessary. In fact, E^* can be greater than $E[EBEsT]$ without changing the result. The limits of E^* are calculated in Appendix I.

$$\begin{aligned}
E[TS|I_{(a',b)}] &= \int_{E_{min}}^{E^*} \tau(x - Es) \frac{1}{b' - a'} dx + \int_{E^*}^b \tau Es \frac{1}{b' - a'} dx \\
&= \frac{\tau}{b' - a'} \left[\frac{E^{*2} - E_{min}^2}{2} \right] - \frac{\tau Es}{b' - a'} (E^* - E_{min}) + \frac{1}{2} \tau Es.
\end{aligned}$$

The difference between the expected values of the tax benefits under different variances is

$$\begin{aligned}
E[TS|I_{(a,b)}] - E[TS|I_{(a',b)}] &= \\
\frac{\tau}{b-a} \left[\frac{E^{*2} - E_{min}^2}{2} - Es(E^* - E_{min}) \right] &- \frac{\tau}{b'-a'} \left[\frac{E^{*2} - E_{min}^2}{2} - Es(E^* - E_{min}) \right].
\end{aligned}$$

Because $\frac{\tau}{b-a} > \frac{\tau}{b'-a'}$ the expected value of the tax shields is greater for the distribution with the smaller variance.⁸

A noisy operating environment provides another dimension that can be used to separate leveraged from nonleveraged ESOP adopters. Because ESOP tax benefits accrue primarily to leveraged plans, firms in noisy operating environments should be less likely to adopt leveraged ESOPs.

But noise has another possible effect. If employees are risk averse, noise reduces the incentive effect of stock ownership. This decreases the value of an ESOP to shareholders and hence the likelihood of adopting either type of plan. So separately estimating the effect of noise on the likelihood of adopting leveraged and nonleveraged plans will provide insight into the dominant effect.

2.3.2 Voting control effects

ESOPs can significantly increase managerial control of voting rights. Managers initiate ESOPs unilaterally and appoint the ESOP's trustees, often from managerial ranks.

⁸This result holds because earnings before taxes are assumed to have a positive mean. This assumption is consistent with the initial assumption of owner-managers' expectations for earnings.

In publicly held corporations, only voting rights belonging to allocated shares must be passed through to employees. Voting rights on unallocated shares are assigned to the trust fiduciary. Managers gain increased voting power without assuming additional residual claim liability. In addition, employee interests are likely to be aligned with management in the initial stages of a takeover attempt. These factors suggest that ESOPs will be used to increase insider control (Chang and Mayers [1992], Gordon and Pound [1990]). Scholes and Wolfson [1990] express a more blunt opinion: “the creation of impediments to changes in corporate control would appear to be the prime motivation for ESOPs.”⁹

In the 1980s the appeal of ESOPs as a takeover defense increased. States enacted anti-takeover laws that enhanced the defensive potency of even relatively small ESOP block holdings (Sokobin [1993]). And the Delaware Chancery Court decision (January 1989) that Polaroid's ESOP followed sound business practice strengthened the legal position of firms adopting ESOPs for defensive purposes (Gordon and Pound [1990]). It is therefore not surprising that empirical evidence supports a defensive role for ESOPs. They have been found to significantly reduce the likelihood of takeover attempts being successful, even after controlling for other defenses (Bhagat and Jefferies [1991], Chaplinsky and Niehaus [1994]).

As in the case for tax benefits, ESOP control benefits differ by the type of plan adopted. While both types of ESOPs transfer blocks of shares to friendly hands, leveraged ESOPs have the potential to transfer considerably larger blocks. Regardless of

⁹Chen and Kensinger [1988] observe that ESOPs can entrench any special interest group at the expense of other shareholders. While the potential for entrenching management has been widely noted, ESOPs can be structured such that any one group gains more control or benefits for less personal risk. During the attempted union buyout of United Airlines in 1990, non-union workers expressed concerns about fairness. (*Denver Post*, April 7, 1990) More recently, flight attendants refused to participate in the successful UAL employee buyout, again citing fairness concerns (NCEO [1994a]).

their initial level of ownership, managers can theoretically transfer control away from outside shareholders. Managers of firms that are potential targets therefore have powerful incentives to adopt leveraged ESOPs. Hence, the voting-control hypothesis implies a negative monotonic relationship between the level of insider ownership and the likelihood of adopting a leveraged ESOP (Beatty [1994]).

The incremental increase in control gained by adopting a nonleveraged ESOP is considerably smaller. Unless it is sufficient to transfer control, it is unlikely that a nonleveraged plan is motivated by defensive considerations. When the level of insider ownership is small, a nonleveraged ESOP will not provide the votes necessary for a defense to be immediately effective. When the level is large, additional ESOP shares are unlikely to significantly increase control. Only when the managers' initial level of ownership approaches effective control does a nonleveraged ESOP provide the marginal vote. Hence, the voting-control hypothesis implies a concave relationship between the likelihood of adopting a nonleveraged ESOP and the level of insider ownership.

Studies modeling the likelihood of adopting an ESOP support the voting-control hypothesis, especially in the presence of other takeover defenses (Table 1, panel c). Beatty [1994] finds the likelihood of adopting a leveraged ESOP is negatively related to insider holdings. The likelihood of adoption also increases in the presence of additional defenses, such as poison pills, golden parachutes, and supermajority laws (Beatty [1994], Sokobin [1993]). But Beatty studies only leveraged ESOPs and Sokobin does not discriminate between leveraged and nonleveraged ESOPs.

Abnormal returns realized over periods in which ESOPs are announced also support the control hypothesis. Absent takeover threats or rumors, they are consistently positive (Table 3, panel a). Chang and Mayers [1992] find positive abnormal returns over

the announcement periods for both leveraged and nonleveraged ESOPs, with larger returns experienced by leveraged plan announcements. When takeover rumors or threats are present (Table 3, panel b), the reaction is consistently significantly negative (Beatty [1995], Chang [1990], Chang and Mayers [1992], Chaplinsky and Niehaus [1994], Gordon and Pound [1990]).

Cross-sectional analysis of announcement period cumulative abnormal returns finds a non-linear relationship between shareholder wealth and insider ownership (Chang and Mayers [1992], Chaplinsky and Niehaus [1994] (Table 2, panel c). The relationship is significantly positive for ownership levels between 10 and 25 percent, generally smaller and insignificant otherwise. The relationship for ownership levels between 10 and 25 percent turns negative in the presence of a takeover threat (Chaplinsky and Niehaus [1994]).

No study has yet to separately examine the control-associated wealth effects of leveraged and nonleveraged plans. Nor has any study looked for nonlinearities in the relationship between the likelihood of adopting either type of ESOP and insider holdings.

2.4 Summary

In addition to examining the efficacy of employee stock ownership as a motivational force, this dissertation considers the premise that leveraged and nonleveraged ESOPs serve different clienteles. This chapter identified tax and control effects that separate those clienteles. The chapter is summarized by the following propositions, with the generic hypothesis to which they relate in parentheses.

Proposition 1 (incentive hypothesis): The likelihood of adopting either type of ESOP is positively related to the strength of employee incentives created by stock ownership.

Proposition 2 (tax hypothesis): The likelihood of adopting a leveraged ESOP is positively related, and the likelihood of adopting a nonleveraged ESOP unrelated, to the ability to use tax shields.

Proposition 3 (tax hypothesis): The likelihood of adopting a leveraged ESOP is negatively related, and the likelihood of adopting a nonleveraged ESOP unrelated, to risk.

Proposition 3a (incentive hypothesis): The likelihood of adopting either type of ESOP is negatively related to risk.

Proposition 4 (control hypothesis): The likelihood of adopting a leveraged ESOP is negatively related to insider ownership; the likelihood of adopting a nonleveraged ESOP is positively, then negatively, related to insider ownership.

Proposition 5 (incentive hypothesis): The change in firm value when either type of ESOP is adopted is positively related to proxies for employee incentives.

Hypothesis 6 (tax hypothesis): The change in firm value when a leveraged ESOP is adopted is positively related, and that the change in firm value when a nonleveraged ESOP is adopted is unrelated, to the ability to use tax shields.

The propositions concerning nonleveraged ESOPs are unexplored. Constructing tests of the first and fifth propositions is hindered by the lack of a rigorous theory that

identifies the source of stock ownership incentives. Chapter 3 develops such a theory. When testing this theory, I control for both the type of ESOP adopted and ESOP tax and control effects, thereby facilitating tests of these 6 propositions.

TABLE 1: Selected results from previous studies using binomial logit regressions to estimate the likelihood of adopting an Employee Stock Ownership Plan.

Author:	Beatty [1994]	Sokobin [1993]	Kruse [1996]
Sample:	Pooled cross-sectional and time series for the years 1987-1990 of 429 firms listed in the <i>Fortune 500</i> in 1986. The sample contains 83 Leveraged ESOP adoption observations, 1236 non-adoption observations. (<i>t</i> -statistics)	All firms adopting new pension plans in 1987 and 1989, identified by IRS form 5500. The 1987 sample size is 468 firms, 71 of which adopted ESOPs. The 1989 sample size is 441 firms, with 95 ESOP adopters. (<i>p</i> -values) 1987 Adopters 1989 Adopters	Random sample panel data set of 110 firms that adopted or maintained ESOPs from 1970-1989. (<i>standard error</i>)
----- <i>Panel a: Employee incentive variables</i> -----			
Capital intensity (employees/firm size)	0.45 (1.91)		0.265 (0.134)
Change in capital intensity (year <i>t</i> -2 to <i>t</i> -1)			0.257 (0.765)
R&D/Sales			-9.522 (6.701)
Change in R&D/Sales (year <i>t</i> -2 to <i>t</i> -1)			14.436 (31.689)
Employment			0.232 (0.078)
Change in employment (year <i>t</i> -2 to <i>t</i> -1)			-0.340 (0.735)
Beta (systematic risk)	0.07 (3.44)		
Root-mean-squared error from fitting market model (unsystematic risk)	-4.27 (-2.71)		
Variance in profit margin (years <i>t</i> -4 to <i>t</i> -1)			0.318 (0.147)

TABLE 1, cont.: Selected results from previous studies using binomial logit regressions to estimate the likelihood of adopting an Employee Stock Ownership Plan.

	Beatty [1994] (<i>t</i> -statistics)	Sokobin [1993] (<i>p</i> -values)		Kruse [1996] (<i>standard error</i>)
		1987 Adopters	1989 Adopters	
<i>Panel b: Tax incentive variables</i>				
Dividend yield	0.09 (0.67)			
Net operating loss	-0.06 (-2.39)			
Normalized capitalized cost of machinery and equipment		0.163 (insignificant)	-0.097 (0.05)	
Normalized contribution that generates maximum tax credit		3.01 (insignificant)	9.69 (insignificant)	
Normalized payroll of employees participating in the pension plan		-0.022 (insignificant)	-0.007 (insignificant)	
<i>Panel c: Voting control variables</i>				
Expected probability of a takeover attempt	1.14 (4.69)			
Percentage of firm owned by insiders	-0.13 (-1.87)			
Indicator variable for 5% purchase of firm in year prior to adoption		-0.004 (insignificant)	-0.057 (insignificant)	
Indicator variable for presence of state anti-takeover laws		-0.013 (insignificant)	0.134 (0.05)	
<i>Panel d: Miscellaneous effects</i>				
Debt/equity ratio	-0.01 (-0.17)			
Normalized debt/equity		-0.014 (insignificant)	0.259 (insignificant)	

TABLE 2: Selected results of cross-sectional regressions on the cumulative abnormal returns realized when an Employee Stock Ownership Plan is announced (*t*-statistics reported in parentheses).

Authors	Chang and Mayers [1992]	Dhillon and Ramirez [1994]	Chaplinsky and Niehaus [1994]	Beatty [1995]
Sample years	1976 - 1989	1979 - 1989	1980 - 1990	1976 - 1989
Sample includes tax credit ESOPs	Yes	Yes	No	Yes
<i>Panel a: Employee incentive variables</i>				
Value of benefit if no other plan is replaced				0.30 (2.96)
<i>Panel b: Tax incentive variables</i>				
Tax benefit				1.33 (2.45)
Effective tax rate		-0.021 (-1.78)		
<i>Panel c: Voting control variables</i>				
Size of ESOP when officers and directors control:				
0 - 10% of votes	0.087 (1.38)			
10 - 20% of votes	0.573 (3.88)			
20 - 30% of votes	0.133 (0.93)			
30-40% of votes	0.014 (0.17)			
40% or more of votes	-0.225 (-1.66)			
Indicator when ESOP is takeover defense	-0.052 (5.38)			
Change in ownership if takeover target				-0.22 (-2.47)
Indicator if new common shares issued				-0.31 (-2.78)
Indicator if new preferred shares issued				-0.25 (-2.40)

TABLE 2, cont.: Selected results of cross-sectional regressions on the cumulative abnormal returns realized when an Employee Stock Ownership Plan is announced.

	Chang and Mayers [1992]	Dhillon and Ramirez [1994]	Chaplinsky and Niehaus [1994]	Beatty [1995]
<i>Panel c, cont.: Voting control variables</i>				
Change in level of insider ownership (within each segment) caused by ESOP				
Less than 10%			0.13 (0.73)	
10 - 25%			0.24 (1.90)	
Greater than 25%			-0.11 (-1.60)	
Change in ownership variables interacted with presence of takeover activity:				
Less than 10%			-0.00 (-0.02)	
10 - 25%			-0.49 (2.63)	
Greater than 25%			-0.26 (-1.53)	
Indicator for presence of takeover activity prior to adoption		1.029 (0.81)	0.48 (0.30)	
Indicator for simultaneous announcement of other defensive measures			-3.51 (-2.28)	
Size of ESOP when insider ownership prior to ESOP is:				
Less than 15%		0.026 (0.62)		
Greater than 15%		-0.231 (-2.40)		

TABLE 2, cont.: Selected results of cross-sectional regressions on the cumulative abnormal returns realized when an Employee Stock Ownership Plan is announced.

	Chang and Mayers [1992]	Dhillon and Ramirez [1994]	Chaplinsky and Niehaus [1994]	Beatty [1995]
<i>Panel d: Miscellaneous effects</i>				
Indicator for leveraged ESOP	0.016 (2.07)	6.226 (3.02)		
Debt/equity ratio	0.004 (3.11)	-0.006 (-0.67)		
Log equity capitalization	-0.007 (-2.39)		-0.73 (-2.90)	
Other confounding announcements			4.40 (2.87)	
<i>F</i> -statistic	5.25 (0.00)	3.19 (0.01)	not reported	not reported (0.001)
Adjusted- R^2	0.25	0.18	0.16	0.16
Number of observations	276	114	198	122

TABLE 3: Selected results from six event studies where the event is the announcement of an Employee Stock Ownership Plan. Each cell contains mean cumulative abnormal return, t -statistic (in parentheses), and number of observations the sample segment {in brackets}.

Authors	Gordon and Pound [1990]	Chang [1990]	Chang and Mayers [1992]	Dhillon and Ramirez [1994]	Chaplinsky and Niehaus [1994]	Beatty [1995]
Sample dates	1987 - July, 1989	1976 - 1987	1976 - 1989	1979 - 1989	1980 - 1990	1976-1989
Tax-credit ESOPs included?	No	Yes	Yes	Yes	No	Yes
Event study method (market proxy, if given)	Net-of-market returns (S&P 500 index)	Market model, 2-day event window	Market model, 2-day event window	Market model, 2-day event window	Net-of market returns (CRSP equally-weighted index)	Market model, 2-day event window reported
----- Panel a: Full sample -----						
<i>Sample Segments</i>						
Full	0.004 (0.9) {94}	0.037 (12.05) {165}	0.007 (3.45) {276}	0.0085 (2.27) {179}		0.0096 (2.13) {122}
----- Panel b: Control-related variables -----						
Takeover speculation present	-0.04 (-3.9) {21}	-0.024 (-4.06) {32}	-0.021 (-4.08) {54}	0.0061 (0.17) {83}		
Pre 1989	-0.033 (-2.6) {9}			0.0329 (6.10) {38}		
Post 1989	-0.045 (-3.0) {12}			-0.0166 (-5.37) {45}		

TABLE 3, cont.: Selected results from six event studies where the event is the announcement of an Employee Stock Ownership Plan.

	Gordon and Pound [1990]	Chang [1990]	Chang and Mayers [1992]	Dhillon and Ramirez [1994]	Chaplinsky and Niehaus [1994]	Beatty [1995]
----- Panel b, cont.: Control-related variables -----						
Pre ESOP insider ownership < 10%, post ESOP > 10%					-0.0127 (-1.78) {27}	
Pre ESOP insider ownership < 10%, post ESOP > 15%					-0.0305 (-3.05) {16}	
No takeover speculation present	0.017 (3.6) {73}	0.024 (7.12) {76}		0.0106 (2.94) {96}	0.0094 (3.70) {159}	
Pre 1989	0.034 (3.3) {25}			0.0113 (1.89) {42}		
Post 1989	0.008 (2.0) {48}			0.0100 (2.45) {54}		
----- Panel c: By ESOP type -----						
Leveraged ESOP					0.008 (3.10) {151}	
Nonleveraged ESOP					0.0065 (1.92) {125}	

Chapter 3

*3 Stock ownership incentives**3.1 Introduction*

This chapter begins by investigating conditions under which employee stock ownership mitigates the free-rider problem; at issue is whether contracts that include employer stock are more efficient than contracts that do not. It then considers how factors that affect employee shirking influence the owner-manager's decision regarding the level of ownership to transfer to employees and the change in firm value that results from such a transfer.

Closer inspection of the free-rider critique suggests at least two reasons why it is too blunt an instrument for analyzing the efficacy of group incentive plans. First, free-rider analysis compares the economic incentives for workers in a team process when all residual claims are held by a central monitor to the economic incentives when the residual claim is distributed equally across team members. But employee stock ownership programs typically are incremental additions to existing compensation plans, assigning only a small fraction of the firm's residual cash flows to each employee. A central monitor remains active. Second, latent in the free-rider critique is the assumption that the marginal utilities of income and shirking are equal. But Alchian and Demsetz [1972] argue that the marginal utility of income will be greater than that of leisure (shirking) when shirking is possible. An individual's realized cost of shirking is less than the true cost, so the individual buys more leisure.

I use insights from the theories of the firm of Alchian and Demsetz [1972] and Demsetz [1983] and adapt the structure of Jensen and Meckling [1976] to analyze the agency relationship between owner-manager and employee. Where Jensen and Meckling

examine the agency problems engendered when an owner-manager sells a partial claim to her firm (i.e., the agent moves from sole to partial ownership), I consider the agency problems resolved by making the employee a partial owner (i.e., the agent moves from zero to partial ownership). The analysis demonstrates that, subject to plausible firm-specific conditions, an equilibrium compensation package that includes employer stock exists that increases firm value. The conditions are functions of employee preferences, the sensitivity of firm value to changes in employee behavior, and a firm's equilibrium marginal monitoring costs. When peer pressure and mutual monitoring are incorporated into the model, it provides a framework that unifies the litany of arguments invoked to explain the efficacy of group incentives: monitoring and information costs, employee self-selection, low cost of changing behavior, and alignment of employer and employee interests.

This chapter proceeds as follows. I begin by considering an employee's choice between wages and on-the-job consumption. First I state the assumptions and develop the definitions necessary for the analysis. The analysis begins in a risk-neutral world of costless perfect information, then sequentially introduces costs and imperfections. This leads to a graphical and mathematical depiction of Demsetz' [1983] labor market equilibrium in which employee compensation bundles are comprised of fixed wages and on-the-job consumption. I then perturb this equilibrium by substituting employer stock for a portion of the employee's fixed wage. This results in a closed form expression that relates the amount employee shirking decreases to firm-specific factors known to or controlled by the owner-manager. Finally, I consider the affect of these factors on the owner-manager's choice for the level of employee ownership and, subsequently, firm value. The effects of risk aversion are considered in Appendix 3.

3.2 *Assumptions and Definitions*

I construct the initial world of perfect information using two sets of assumptions; one permanent, the other temporary.

The permanent assumptions are:

- (P.1) Owner-managers are risk neutral and maximize firm value.
- (P.2) Workers maximize utility over pecuniary compensation (fixed wages) and on-the-job consumption, with decreasing marginal utility in both arguments.¹⁰
- (P.3) There exist innumerable owner-managers and employees with diverse monitoring abilities and individual preferences.
- (P.4) All market participants are atomistic price takers whose individual actions do not affect the general labor market equilibrium.
- (P.5) Total compensation is allocated between pecuniary wages and the cost of on-the-job consumption. Employees in a given quality group receive the same market-determined total compensation but not necessarily the same allocation (Demsetz [1983]).
- (P.6) Neither the supply of nor the demand for labor is perfectly elastic.
- (P.7) All taxes are zero.
- (P.8) The owner-manager retains a majority interest in her firm.
- (P.9) Firm production technology exhibits decreasing returns to scale.

The temporary assumptions are:

- (T.1) Monitoring is costless.
- (T.2) Monitoring is perfect.

¹⁰This implicitly assumes that workers have found the quality group that maximizes their productive capability.

(T.3) Workers are risk neutral.

Demsetz [1983] maintains that total employee compensation derives from two sources: wages (pecuniary compensation) and on-the-job consumption. Firms with a relative advantage in monitoring allocate more of their total compensation to monetary wages. This chapter considers the apportionment of employee compensation between pecuniary compensation and on-the-job consumption. To move forward requires definitions for the cost of on-the-job consumption and a measure of total employee compensation. I adapt the structure of Jensen and Meckling [1976] to this end.

Jensen and Meckling [1976] define a vector $\mathbf{X} = \{x_1, x_2, \dots, x_k\}$ of on-the-job consumption that includes items under an owner-manager's discretion. Their examples include individual employee attributes and the lushness of office decor. The employee I consider is unlikely to have such discretionary authority. Instead, my \mathbf{X} contains factors of production over which the employee has some degree of control, such as the lengths of coffee and lunch breaks, the hours spent exerting less than optimal effort, and the personal use of a firm's copy machine, mail, and phone service. Employee utility increases in all elements of \mathbf{X} .

When \mathbf{X} is combined with a vector \mathbf{Z} of owner-manager supplied factors of production (e.g., capital, equipment, and raw materials), all productive inputs are present. The scale of production, \mathbf{Z} , is fixed throughout. Following Jensen and Meckling, define $C(\mathbf{X}, \mathbf{Z})$ to be the cost of supplying \mathbf{X} and \mathbf{Z} , and $P(\mathbf{X}, \mathbf{Z})$ to be the revenue produced. Then $B(\mathbf{X}, \mathbf{Z}) = P(\mathbf{X}, \mathbf{Z}) - C(\mathbf{X}, \mathbf{Z})$ is the net dollar benefit flow to the firm from an employee's consumption of \mathbf{X} , given \mathbf{Z} . It is the employee's net marginal revenue product. There will exist some vector \mathbf{X} , given \mathbf{Z} , that maximizes this net dollar

benefit flow. Let X^* be that vector.¹¹ I call this maximum value the employee's maximum marginal revenue product (*MMRP*), where $MMRP = B(X^*, Z)$.

While the employee never consumes less than X^* , he wants to consume more. Doing so reduces the employee's net marginal revenue product, because the cost of the additional on-the-job consumption is greater than the revenue it produces. Let \widehat{X} be a vector of employee on-the-job consumption, where $\widehat{X} > X^*$. Then the dollar cost to the firm of the employee's on-the-job consumption is $B(X^*, Z) - B(\widehat{X}, Z)$. This cost to the owner-manager is a benefit to the employee. I call it nonpecuniary compensation (*NP*). It is analogous to Jensen and Meckling's *F*.

By definition, the employee's maximum marginal revenue product is comprised of the dollar values of two benefit flows: his net marginal revenue product and nonpecuniary compensation. While the value of the maximum marginal revenue product is fixed for a given worker and scale of operation, the amounts apportioned to its two components are not.

My employee derives utility from consuming on the job and monetary wages. The sum of his monetary wages (pecuniary compensation, *P*) and nonpecuniary compensation is his total compensation. This is analogous to Jensen and Meckling [1976]. Their owner-manager derives utility from consuming on the job and the firm's cash flow. The sum of the dollar value of these two flows is the value of the firm to the owner-manager.

Note the distinction between nonpecuniary compensation and on-the-job consumption. On-the-job consumption is the process of using firm assets to increase

¹¹As Jensen and Meckling note, $\frac{\partial B(X^*, Z)}{\partial X} = \frac{\partial P(X^*, Z)}{\partial X} - \frac{\partial C(X^*, Z)}{\partial X} = 0$. I further assume a well-behaved, universally concave production function, where $\frac{\partial B(X, Z)}{\partial x_i} > 0 \forall x_i < x_i^*$ and $\frac{\partial B(X, Z)}{\partial x_i} < 0 \forall x_i > x_i^*$, $i = 1, 2, \dots, k$.

personal utility and firm product. Nonpecuniary compensation is the net dollar cost of this consumption. On-the-job consumption must exceed the level that maximizes the net dollar benefit flow to the owner-manager (X^*) before nonpecuniary compensation exists (i.e., is positive). As in Jensen and Meckling [1976], all dollar denominated variables are current market values of the period by period cash flows involved, taking into account the probability distributions of these cash flows.

3.3 *Equilibrium compensation bundles*

3.3.1 *The compensation mix in a perfect world.*

Assume a market exists that determines the price (CL_p) for a given quality of labor. Further, in the spirit of Demsetz [1983], let the market price of labor reflect both pecuniary and nonpecuniary compensation and be observable by all participants. Now consider the hiring decision faced by a value-maximizing owner-manager in a world of perfect costless information. Non-negative profits require that the employee's total compensation never exceed the employee's maximum marginal revenue product. If a prospective employee's maximum marginal revenue product is greater than or equal to and his reservation wage less than or equal to the market price of labor, he is engaged.

The employee maximizes his utility through his choice of on-the-job consumption. The owner-manager monitors the employee's on-the-job consumption and pays the difference between its cost and the market price of labor in monetary wages. Because monitoring is perfect and costless, wages and the cost of on-the-job consumption are perfectly inversely correlated (Demsetz [1983]). Therefore

$$P = CL_p - NP \tag{1}$$

where P denotes pecuniary compensation (wages) and NP denotes nonpecuniary compensation (the cost of the employee's on-the-job consumption).

Figure 1 depicts these relationships and serves as the base case for the ensuing analysis. In Figure 1a the market supply and demand schedules for labor identify the market-clearing price of labor, CL_p . In Figure 1b the line $\overline{P_pNP_p}$ represents all combinations of pecuniary and nonpecuniary compensation that sum to this market price. I call this line the labor price constraint, LPC_p . An employee with preferences mapped by U_p maximizes his utility by consuming NP_a on the job and receiving P_a in fixed wages. Workers are engaged until the marginal employee's maximum marginal revenue product equals the market price of labor ($MMRP = CL_p$).

The employee's choice. After internalizing equation (1) the employee's unconstrained maximization problem is

$$\underset{\{NP\}}{Max} U(P(NP), NP) \quad (2)$$

with first order condition

$$\frac{\partial P}{\partial NP} = - \frac{U_{NP}}{U_P} = -1 \quad (3)$$

where U_{NP} and U_P are the partial derivatives of utility with respect to nonpecuniary and pecuniary compensation. The employee's marginal rate of substitution in consumption equals the owner-manager's marginal rate of substitution in exchange. The equilibrium marginal utilities of wages (pecuniary compensation) and on-the-job consumption (nonpecuniary compensation) are equal.

This scenario is analogous to that described by Jensen and Meckling [1976] when their owner-manager owns 100 percent of her firm's residual claim. Then the cost of her on-the-job consumption and the value of her residual claim are perfectly and inversely

correlated. In the case of an employee's choice between on-the-job consumption and wages, perfect costless monitoring ensures a perfect inverse correlation between the cost of on-the-job consumption and wages.

As the analysis proceeds, monitoring becomes costly and imperfect, the supply and demand schedules for labor shift, and the marginal employee changes. To facilitate comparisons across the different information regimes, I also consider an inframarginal employee whose maximum marginal revenue product remains constant throughout. This inframarginal employee's maximum marginal revenue product ($MMRP_{if}$ in Figure 1b) is greater than the market price of labor, CL_p . While both owner-manager and inframarginal employee realize a surplus (Figure 1a), only the owner-manager's surplus appears in Figure 1b (the vertical distance between $\overline{P_pNP_p}$ and $\overline{P_{if}NP_{if}}$).

3.3.1a Employee stock ownership irrelevance in a perfect world

Consider the effect of substituting employer stock for fixed wages on an employee that has maximized her utility in this world of perfect information. Because monitoring is perfect, changes in employee on-the-job consumption will not affect total employee compensation or the price of the employer's stock. And because both owner-manager and employee are risk neutral, they are indifferent to paying or receiving stock or fixed wages. However, any change in the employee's on-the-job consumption moves her compensation bundle along the labor price constraint, away from her optimal compensation bundle, and thereby decreases her utility. Therefore, a rational employee will not change her on-the-job consumption upon receiving stock in lieu of wages.

To motivate voluntary reductions in on-the-job consumption, stock ownership must promise the employee increased utility. Because the marginal utilities of pecuniary and nonpecuniary compensation are equal, pecuniary gains greater than the nonpecuniary

compensation forgone must be promised. But then total compensation will be greater than what is necessary to hire the employee. It will not be offered.

In this world of perfect costless information, rational incentive plans that use employer stock to exchange pecuniary gains for reduced on-the-job consumption cannot increase employee utility. Hence, such plans will not motivate reduced on-the-job consumption. Employee stock ownership neither increases or decreases employee utility nor affects firm value. It is irrelevant.

3.3.2 *The compensation mix when monitoring is perfect but costly*

Overview of changes induced by costly monitoring. Relaxing assumption T.1 (monitoring is costless) creates a world of perfect but costly information. This changes many characteristics of the previous equilibrium solution. The market-clearing price of labor, the quantity of labor supplied, the size of the feasible set of compensation bundles, employee utility, and firm value decrease. There is also limited self-selection of employers by employees. Firms with a relative advantage in monitoring attract workers with preferences for pecuniary compensation, while firms with a relative advantage in providing on-the-job consumption attract workers with preferences for nonpecuniary compensation (Alchian and Demsetz [1972] and Demsetz [1983]). Nonetheless, the marginal utilities of pecuniary and nonpecuniary compensation remain equal for workers who are hired. Hence, employee stock ownership remains irrelevant.

Monitoring. Consider an arbitrary monitoring cost function $NP(M)$, uniquely determined by a firm's organizational structure and production technology (Demsetz [1983]). To focus on the marginal effect of stock-ownership, I define monitoring to include both direct monitoring and all properly structured monetary and nonmonetary incentives other than stock ownership. Let $NP(M)$ denote the maximum dollar value an

employee can consume on the job when M dollars are spent monitoring his activity. As per Jensen and Meckling [1976], spending more decreases nonpecuniary compensation ($\frac{\partial NP}{\partial M} < 0$) at a decreasing rate ($\frac{\partial^2 NP}{\partial M^2} > 0$).¹²

Figure 2 illustrates one possible monitoring cost function. The y -axis represents total monitoring costs, the x -axis nonpecuniary compensation. (The inframarginal employee's maximum marginal revenue product line is included for reference.) If an owner-manager spends nothing monitoring her employee, the employee consumes more on the job than his maximum marginal revenue product. A rational owner-manager therefore will incur monitoring costs to reduce the employee's nonpecuniary compensation. For example, the owner-manager could restrict the cost of the employee's on-the-job consumption to NP_b by incurring monitoring costs of M_b . The amount spent on monitoring determines the amount of on-the-job consumption, but nothing is lost by reversing the direction of causality. An owner-manager may also decide how much employee on-the-job consumption she will tolerate and select her monitoring budget accordingly.

Rational limits on monitoring. Rational behavior by the owner-manager delimits the range of monitoring activity. Rational behavior implies that monitoring costs will be incurred only if monitoring reduces (or restricts) on-the-job consumption, so $\frac{\partial M}{\partial NP}$ is negative. Further, at the margin value-maximizing owner-managers will not incur

¹²The monitoring function I consider assumes an inverse relationship between monitoring costs and nonpecuniary compensation that increases at an increasing rate, i.e., it is strictly convex. Nothing proscribes monitoring functions that increase inversely with nonpecuniary compensation at constant or decreasing rates, or monitoring functions that are constant. But the latter two cases yield uninteresting implications. Monitoring costs that increase at a decreasing rate imply all nonpecuniary compensation will be eliminated (provided it is worthwhile to monitor at all). Constant monitoring costs, i.e., all on-the-job consumption is observable by incurring a single fixed monitoring cost, imply a solution identical to perfect costless monitoring but with some loss of surplus. Neither of these two cases suggests a need for employee incentives. A monitoring cost function that increases at a constant rate is convex, just not strictly convex, and so is a special case of the convex monitoring functions I consider.

marginal monitoring costs greater than the amount they expect to gain from reduced on-the-job consumption ($|\Delta M| \leq \Delta NP$). This implies a lower limit for $\frac{\partial M}{\partial NP}$ of -1 .

There is also a more subtle constraint on monitoring. When employees view total compensation as comprised of pecuniary and nonpecuniary compensation (Alchian and Demsetz [1972], Demsetz [1983]), $\frac{\partial M}{\partial NP}$ approaches but never equals -1 . This is so because reductions in on-the-job consumption will be perceived by employees as reductions in their total compensation. Employees will require additional compensation for the reduction in on-the-job consumption (ΔNP) imposed by an incremental increase in monitoring (ΔM). This incremental increase in pecuniary compensation is an implicit marginal monitoring cost for owners. Because of this implicit cost, it will never be efficient to increase monitoring to the point where $|\Delta M| = \Delta NP$. This latter limit becomes important when the analysis moves into a world of costly imperfect monitoring.

Net marginal revenue constraint. Non-negative profits require that an employee's maximum marginal revenue product be greater than or equal to her total compensation plus monitoring costs. That is,

$$MMRP \geq P + NP + M \quad (4)$$

Therefore, the maximum pecuniary wage that will be offered is

$$P = MMRP - NP - M \quad (5)$$

Equation (5) is the vertical difference between an employee's maximum marginal revenue product and the monitoring function. I call it the net marginal revenue constraint (*NMRC*) and depict it in Figure 3.

Figures 2 and 3 convey the same information but in different spaces. At point b in Figure 2, an owner-manager spends M_b monitoring her employee, thereby restricting the cost of that employee's on-the-job consumption to nonpecuniary compensation NP_b and

leaving P_b available for pecuniary compensation. Point b' on the net marginal revenue constraint in Figure 3 also identifies M_b , NP_b , and P_b . Monitoring costs are the vertical distance between b' and $\overline{P_{if}NP_{if}}$, nonpecuniary compensation remains the horizontal distance from the origin, and pecuniary compensation P_b is the y -coordinate of b' .

The net marginal revenue constraint is the zero-profit isoprofit line for all compensation bundles. A rational owner-manager will not offer her employee a compensation bundle that lies above the net marginal revenue constraint. Therefore, the change from costless to costly perfect monitoring shifts the outer bound of the feasible set of compensation bundles inward, from $\overline{P_{if}NP_{if}}$ to $NMRC$. The size of the feasible set of compensation bundles decreases.

Market price of labor. Costly monitoring shifts the demand schedule for labor downward, from D_p to D_{cp} in Figure 4a. The quantity of labor supplied and total surplus decrease. The market-clearing price of labor decreases from CL_p to CL_{cp} , less than the cost of monitoring. Reflecting this lower market price of labor, the labor price constraint shifts down to LPC_{cp} (Figure 4b).

When the monitoring cost function is sufficiently convex, total monitoring costs are high enough, and the maximum marginal revenue product is low enough, the net marginal revenue and labor price constraints intersect (e.g., point c in Figure 4b). While the owner-manager could offer the compensation bundles on the net marginal revenue constraint between c and the x -axis, e.g. point d , she need only offer those on the segment $\overline{cNP_{cp}}$, such as point e . As a result, the employee opportunity set is kinked, bounded by the labor price constraint between NP_{cp} and c , and by the net marginal revenue constraint ($NMRC_{cp}$) between c and the y -axis.

The kink in the employee's opportunity set implies a limited clientele effect. If the employee's utility is maximized by compensation bundles that plot on the line

segment $\overline{cNP_{cp}}$ such as point e , he will accept employment. But if the employee's utility is maximized by a point on the segment $\overline{P_{cp}c}$ he will seek employment elsewhere. For example, employees whose preferences are illustrated by U_f will seek employment with firms whose net marginal revenue constraints intersect $\overline{P_{cp}NP_{cp}}$ between f and the y -axis. Should no such firm exist, the worker chooses leisure or self-employment.¹³ The surplus from the inframarginal employee decreases to the distance between points d and e . Firm value decreases.

Note how the effectiveness of monitoring affects the mix of pecuniary and nonpecuniary compensation. When monitoring costs increase rapidly relative to the cost of on-the-job consumption (monitoring is less effective), the net marginal revenue constraint intersects the labor price constraint nearer the x -axis. There will be relatively more nonpecuniary and less pecuniary compensation in the optimal compensation bundle. But when monitoring costs increase gradually (monitoring is more effective), the two constraints intersect nearer the y -axis. There will be relatively more pecuniary and less nonpecuniary compensation in the optimal bundle.

Costly perfect monitoring restricts the equilibrium solution to a segment of $\overline{P_{cp}NP_{cp}}$. While this implies that some employees may choose leisure or another employer, the equilibrium marginal utilities of pecuniary and nonpecuniary compensation for those that are engaged remain equal. Hence, employee stock ownership remains irrelevant.

¹³Self-employment eliminates all agency costs.

3.3.3 *The compensation mix when monitoring is costly and imperfect*

Relaxing assumption T.2 (monitoring is perfect) moves the analysis into a world of imperfect and costly monitoring. When monitoring is imperfect, workers will shirk. Nonpecuniary compensation thus has two sources: the cost of known or observable on-the-job consumption (OTJ); and the cost of estimable but unobservable or unattributable on-the-job consumption, or shirking (\mathcal{E}) (Alchian and Demsetz [1972], Demsetz [1983]). The sum of these two costs, $OTJ + \mathcal{E}$, is the cost to the owner-manager of nonpecuniary compensation.¹⁴

Overview of the changes induced by shirking. The ability to shirk further alters the equilibrium solution: the quantity of labor supplied decreases;¹⁵ the owner-manager loses more surplus; the cost to the employer of an employee's total compensation increases; the binding constraint on employee utility no longer equates the marginal utilities of pecuniary and nonpecuniary compensation; and a perfect clientele effect emerges between workers and employers. The effect of the change from perfect to imperfect costly monitoring on employee utility is ambiguous.

Shirking. Theories of the firm recognize that incentives to shirk exist in any contractual arrangement when monitoring is costly and imperfect. Because some on-the-job consumption is either prohibitively costly or impossible to observe or assign, employees will increase their utility by shirking. (Alchian and Demsetz [1972], Demsetz [1983], Jensen and Meckling [1976])

¹⁴Though nonpecuniary compensation now derives from known on-the-job consumption and shirking, its mathematical definition is unchanged. On-the-job consumption only generates a cost when $\hat{X} > \hat{X}^*$ regardless of the observability of \hat{X} .

¹⁵This assumes that the value employees place on shirking is less than the cost of their shirking to owner-managers. In this case, both supply and demand curves shift down, but the supply curve shifts down by less.

Nonetheless, utility gains from shirking must be limited—an assumption implicit in the theories of the firm cited previously. If not, wage-based contracting would be far less common than it is. Shirking occurs within the context of work, limiting the choice of utility-producing elements of consumption. As shirking increases, the employee must select from a decreasing number of increasingly less appealing elements. If, as I assume, the likelihood of and penalties from detection increase with shirking, at some point the expected cost of detection will offset the utility gained from additional shirking. Therefore, employees balance the marginal utility of shirking with the marginal disutility of detection.

To model this process I introduce a shirking deflator, $\lambda(\mathcal{E}, M)$, where $\lambda(\mathcal{E}, M) \leq 1$. The shirking deflator decreases at an increasing rate as shirking and monitoring increase $\left(\frac{\partial \lambda(\mathcal{E}, M)}{\partial \mathcal{E}} < 0, \frac{\partial^2 \lambda(\mathcal{E}, M)}{\partial \mathcal{E}^2} < 0, \frac{\partial \lambda(\mathcal{E}, M)}{\partial M} < 0, \text{ and } \frac{\partial^2 \lambda(\mathcal{E}, M)}{\partial M^2} < 0 \right)$. Shirking enters employee utility functions as the product of the deflator and the dollar cost of shirking, $\lambda(\mathcal{E}, M)\mathcal{E}$. As shirking increases, it first increases, then has no effect upon, and finally decreases employee utility.¹⁶

Though shirking is by definition either undetectable or unassignable, it is not unexpected. The owner-manager estimates the amount of shirking that will occur and includes it in the nonpecuniary portion of employee compensation bundles. The estimate must be accurate in the long run. If consistently too low, an employee's total compensation will be worth more than her maximum marginal revenue product and the firm will run inefficiently. If the estimate is too high, the compensation bundle will be worth less than the market price of labor and the owner-manager will be unable to attract

¹⁶This can be seen by examining the first derivative of $\lambda(\mathcal{E})\mathcal{E}$ with respect to \mathcal{E} . For small levels of \mathcal{E} , $\frac{\partial \lambda(\mathcal{E})}{\partial \mathcal{E}}\mathcal{E} + \lambda(\mathcal{E})$ is positive. Shirking increases utility. When $\frac{\partial \lambda(\mathcal{E})}{\partial \mathcal{E}}\mathcal{E} = -\lambda(\mathcal{E})$ shirking's marginal effect on utility is zero. With additional shirking $\frac{\partial \lambda(\mathcal{E})}{\partial \mathcal{E}}\mathcal{E} + \lambda(\mathcal{E})$ becomes negative.

qualified workers. Therefore, though the cost of shirking is not known *ex ante* or in the short run, market forces require that its expectation be accurately reflected in compensation packages.

The monitoring cost function. The ability to shirk alters the relationship between monitoring expenditures and total nonpecuniary compensation. For a given level of monitoring, total nonpecuniary compensation increases (Alchian and Demsetz [1972], Demsetz [1983]).¹⁷ As a result, the monitoring cost function shifts to the right, more so as monitoring decreases (Figure 5).

Net marginal revenue constraint. Substituting the cost of known on-the-job consumption (*OTJ*) and the expected cost of shirking ($E(\mathcal{E})$) for nonpecuniary compensation (*NP*) in equation (5), the new expression for the net marginal revenue constraint becomes

$$P = MMRP - M - OTJ - E(\mathcal{E}) \quad (6)$$

where P once again equals the maximum amount available for pecuniary compensation.

The shift in the monitoring cost function induces a diagonal shift in the net marginal revenue constraint. Recall that, subject to non-negative profits, the amount of funds available for pecuniary compensation (P) is the vertical distance between the monitoring cost function and an employee's maximum marginal revenue product (in monitoring cost/nonpecuniary compensation space). Therefore, for a given level of monitoring, the increase in nonpecuniary compensation due to shirking decreases the amount of an employee's maximum marginal product available for pecuniary compensation (shown in Figure 5). This causes the net marginal revenue constraint (the

¹⁷Alchian and Demsetz [1972] observe that "... with detection, policing, monitoring, or metering costs, each person will be induced to take more leisure" than when monitoring is perfect. Demsetz [1983] observes that "the amount of collective consumption by the group will be higher" than what would occur with zero monitoring costs.

maximum funds available for pecuniary compensation (P) plotted in pecuniary/nonpecuniary compensation space) to shift downward and to the right by the expected cost of shirking (Figure 6).

Market price of labor. Anticipating shirking, owner-managers decrease the value of the compensation bundles (comprised of pecuniary compensation and the cost of known on-the-job consumption) they offer the labor market. This shifts the demand schedule for labor downward by the cost of anticipated shirking, from D_{cp} to D_{ci} (Figure 7a).

But the value of shirking to employees is less than its cost to owner-managers, so the supply schedule for labor shifts down by less than the cost of shirking to owner-managers, from $S_{p,cp}$ to S_{ci} . The observable market price of labor (that excludes shirking) decreases by less than the expected cost of shirking, from CL_{cp} to CL_{ci} . The quantity of labor supplied decreases from Q_{cp} to Q_{ci} . Total surplus, the area that lies above the supply curve and below the demand curve, decreases .

Though the expected cost of shirking is not reflected in the observable market price of labor, both owner-manager and employee view shirking as part of the employee's total compensation. Hence, the effective market price of labor is the sum of pecuniary compensation, the cost of known on-the-job consumption, and the expected cost of shirking. It is this effective price that constrains employee utility. The line that represents all bundles that sum to the effective market price of labor, what I call the effective labor price constraint, is depicted as $ELPC_{ci}$ in Figure 7b.

Because the expected cost of shirking is greater than the decrease in the observable market price of labor, an employee's compensation bundle (including shirking) costs the owner-manager more than when monitoring is perfect and costly. The

effective labor price constraint under costly and imperfect monitoring ($ELPC_{ci}$) lies to the right of the labor price constraint under costly and perfect monitoring (LPC_{cp}). The magnitude of the outward shift is the difference between the expected cost of shirking and the change in the observable market price of labor, what I call the shirking premium ($E(\mathcal{E}) - \Delta CL$, where $\Delta CL = CL_{cp} - CL_{ci}$).

Equilibrium solution. The market price of labor contains two goods, pecuniary and nonpecuniary compensation. The allocation of these goods in the optimal compensation bundle, hence the optimal amount of monitoring, results from an exchange of these two goods between the owner-manager and employee based upon the relative values placed on the goods by each individual. The slopes of the owner-manager's net marginal revenue constraint and the employee's indifference curve are the ratios of their respective relative prices for pecuniary and nonpecuniary compensation (their marginal rates of substitution in exchange and consumption). The point at which the employee's indifference curve is tangent to the owner-manager's net marginal revenue constraint maximizes employee utility and equates the marginal rates of substitution in exchange and consumption, consistent with the observations of Alchian and Demsetz [1972].¹⁸

The employee expects to receive the effective market price of labor (the observable market price—the sum of pecuniary compensation and the cost of known on-the-job consumption—plus shirking); the owner-manager will not offer more. As long as the point of tangency between employee indifference curves and the net marginal revenue constraint lies above the effective labor price constraint, workers will be added. For each additional worker, the maximum marginal revenue product line and net marginal revenue

¹⁸For example, when the slope of the net marginal revenue constraint equals $-\frac{1}{2}$, the owner-manager is indifferent between paying one incremental unit of pecuniary or two incremental units of nonpecuniary compensation. Likewise, when the slope of the worker's indifference curve ($-\frac{\partial U_{NP}}{\partial U_P}$) equals $-\frac{1}{2}$, the worker is indifferent between receiving one incremental unit of pecuniary or two incremental units of nonpecuniary compensation.

constraint shift down (production technology exhibits decreasing returns to scale). Equilibrium is reached and the compensation bundle identified when the point of tangency intersects the effective labor price constraint. All surplus at the margin vanishes. The inframarginal employee of the two previous information regimes becomes the marginal employee.

Figure 7b illustrates the new equilibrium solution. Potential employees with preferences mapped by indifference curves (U_{ci}) tangent to the net marginal revenue constraint ($NMRC_{ci}$) at its intersection with the labor price constraint ($ELPC_{ci}$), point g , will seek employment from and be sought for employment by the owner-manager. Other potential employees will seek employment elsewhere. Innumerable and diverse owner-managers and workers ensure continuous solutions along the labor price constraint.¹⁹

The change from perfect to imperfect costly monitoring and the resultant shirking yields a counter-intuitive implication: the ability to shirk does not necessarily leave the employee worse off than when monitoring is costly and perfect. Whether or not employee utility increases depends upon the degree to which the owner-manager and employee view pecuniary and nonpecuniary compensation as substitutes.

Substitutability is reflected by the convexities of the owner-manager's net marginal revenue constraint and the employee's indifference curve around the equilibrium solution. When both owner-manager and employee regard pecuniary and nonpecuniary compensation as poor substitutes, the owner-manager's net marginal revenue constraint and employee's indifference curves are relatively more curved. In this case, the change

¹⁹The fact that the equilibrium compensation bundle is identified by the point of tangency between an employee's indifference curve and an owner-manager's net marginal revenue constraint offers another, simpler way to see that $\frac{\partial M}{\partial NP}$ approaches but never equals -1 . . An $\frac{\partial M}{\partial NP}$ equal to -1 implies a slope of 0 for both curves at this point. This violates the assumption of increasing employee utility in nonpecuniary compensation.

from perfect to imperfect monitoring (the ability to shirk) makes the employee worse off. But when owner-manager and employee view pecuniary and nonpecuniary compensation as good substitutes, e.g., the relative values both parties place on them change little in the neighborhood of the equilibrium, their respective net marginal revenue constraint and indifference curves will be relatively less curved. Though economically unlikely, if the employee simultaneously values shirking very little (i.e., the shirking premium is large), the employee may not lose and may even realize an increase in utility when shirking is possible. In either case, both owner-manager and employee are worse off when monitoring is costly and imperfect than when it is costless and perfect.²⁰

3.4 *Shirking and employee stock ownership*

I now develop the model from which testable propositions are derived. The ultimate goal is to analyze the effect of employee stock ownership on firm value. However, this can be done only after addressing the effect of stock ownership on employee behavior, the focus of this section. Section 3.4.1 identifies the equilibrium conditions prior to making the employee a partial owner. Section 3.4.2 perturbs this equilibrium by adding stock to the employee's compensation bundle, then demonstrates that shirking can decrease as a result. Section 3.4.3 develops an expression that relates the amount that shirking decreases (and hence, firm value increases) to the level of the employee's stock ownership and employer monitoring. Section 3.4.4 considers the factors that affect the employee's decision.

²⁰As noted, though this scenario is mathematically possible it is economically unlikely. For the employee to be better off after the change from perfect to imperfect costly monitoring, the shirking premium must be large. This implies she values shirking very little and her indifference curve in the area of the perfect costly monitoring solution is relatively flat (pecuniary and nonpecuniary compensation are complements). But a flat indifference curve conflicts with the other necessary condition, that pecuniary and nonpecuniary compensation be good substitutes. Hence, though theoretically possible, it is economically unlikely that the ability to shirk will increase employee utility.

The focus moves to the owner-manager's decision in section 3.5. Sections 3.5.1 and 3.5.2 consider the owner-manager's choice of the level of employee ownership over the short- and long-term, respectively. Section 3.5.3 derives inferences regarding the effect of employee stock ownership on firm value.

3.4.1 *Equilibrium conditions prior to employee stock ownership*

This section identifies the equilibrium levels of monitoring and employee shirking prior to employee stock ownership. Establishing the level of monitoring is important because monitoring is unchanged by the initiation of stock ownership, at least in the short run. The pre-stock-ownership level of shirking provides a basis for comparison with the changes wrought by stock ownership.

Consider the employee's choice of known on-the-job consumption and shirking. The employee faces the constrained maximization problem

$$\underset{\{OTJ, \mathcal{E}\}}{Max} U(P(E[NP]), g(NP)) \quad (7)$$

subject to

$$P = MMRP - E[NP] - M(E[NP]) \quad (8)$$

where the expected cost of on-the-job consumption to the owner, $E[NP]$, and the value of on-the-job consumption to the worker, $g(NP)$, are defined as

$$\begin{aligned} E[NP] &= OTJ + E(\mathcal{E}) \text{ and} \\ g(NP) &= OTJ + \lambda(\mathcal{E})\mathcal{E} \end{aligned} \quad (9)$$

After internalizing the constraint the first order conditions (derived in Appendix 2A) are

$$\begin{aligned} \frac{\partial U}{\partial P} \left(-1 - \frac{\partial M(E[NP])}{\partial E[NP]} \right) + \frac{\partial U}{\partial g(NP)} &= 0 \\ \frac{\partial U}{\partial g(NP)} \left(\frac{\partial \lambda}{\partial \mathcal{E}} \mathcal{E} + \lambda \right) &= 0 \end{aligned} \quad (10)$$

Employee self-selection assures these conditions will be satisfied. Consistent with Demsetz [1983], only workers whose preferences balance the owner-manager's relative prices for pecuniary and nonpecuniary compensation will seek employment from this firm. This implies that, in equilibrium, the cost of an employee's shirking equals that expected by the owner-manager ($\mathcal{E}^* = E[\mathcal{E}]$). The condition that self-selection equate the realized with the expected costs of nonpecuniary compensation is formalized by substituting \mathcal{E}^* for $E[\mathcal{E}]$ into the first of the definitions (9), thus

$$E[NP] = OTJ^* + \mathcal{E}^* = NP^*. \quad (11)$$

If this condition is not met, the worker chooses another employer, self-employment, or leisure.

Substituting NP^* and \mathcal{E}^* into the first order conditions (10) yields the identities

$$\begin{aligned} \frac{\partial U}{\partial P^*} \left(-1 - \frac{\partial M}{\partial NP^*} \right) + \frac{\partial U}{\partial g(NP^*)} &\equiv 0 \\ \frac{\partial U}{\partial g(NP^*)} \left(\frac{\partial \lambda}{\partial \mathcal{E}^*} \mathcal{E}^* + \lambda(\mathcal{E}^*) \right) &\equiv 0 \end{aligned} \quad (12)$$

where $\frac{\partial M}{\partial NP^*} = \frac{\partial M(E[NP])}{\partial E[NP]}$ (from equation (11)) and $\frac{\partial M}{\partial NP^*}$, $\frac{\partial U}{\partial g(NP^*)}$, $\frac{\partial \lambda}{\partial \mathcal{E}^*}$, and $\frac{\partial U}{\partial P^*}$ represent partial derivatives of functions evaluated in the neighborhood of the equilibrium (notation adapted from Chiang [1984]). These identities capture much of the intuition developed thus far. Because employee utility increases in nonpecuniary compensation ($\frac{\partial U}{\partial g(NP)} > 0$), the second identity will be satisfied only if

$$\frac{\partial \lambda}{\partial \mathcal{E}^*} \mathcal{E}^* + \lambda(\mathcal{E}^*) \equiv 0. \quad (13)$$

Hence, equation (13) implies that the marginal utility of additional shirking is zero. Rearranging the first condition yields

$$\left(-1 - \frac{\partial M}{\partial NP^*} \right) \equiv - \frac{\frac{\partial U}{\partial g(NP^*)}}{\frac{\partial U}{\partial P^*}}. \quad (14)$$

Equation (14) implies that the marginal utility of nonpecuniary compensation is less than that of pecuniary compensation (because $-1 < \frac{\partial M}{\partial NP^*} < 0$).

3.4.1a The free-rider problem with costly imperfect monitoring

Note the implications of equation (14) for the free-rider critique. The critique implicitly assumes equal or nearly equal marginal utilities of pecuniary and nonpecuniary compensation. But when monitoring is imperfect the relative values of pecuniary and nonpecuniary compensation are a function of $\frac{\partial M}{\partial NP}$, the slope of the monitoring cost function. As $\frac{\partial M}{\partial NP}$ approaches its rational limit of -1 , equation (14) implies that the marginal utility of nonpecuniary compensation is much less than that of pecuniary compensation. So, though the individual pecuniary gain promised by a group incentive is small, it nonetheless can yield positive marginal utility and thereby motivate employees to reduce their shirking.

This motivational effect does not ignore the free-rider problem. Certainly group members who do not reduce their shirking benefit from those who do. But when equilibrium marginal monitoring costs are large relative to the decrease in shirking they induce (i.e., $\frac{\partial M}{\partial NP}$ approaches -1), even employees inclined to free ride will be motivated to reduce their shirking by their own self-interest. Any gains in firm value due to peer pressure, mutual monitoring, or positive externalities are in addition to those considered here.

The slope of the monitoring cost function, $\frac{\partial M}{\partial NP}$, is important to the development that follows but awkward to label. But by considering its discrete form, $\frac{\Delta M}{\Delta NP}$, then

normalizing the denominator, it is seen to be a simple function of a firm's marginal monitoring costs. As marginal monitoring costs increase relative to their marginal benefits, $\frac{\partial M}{\partial NP}$ approaches -1 ; monitoring is less effective. When marginal monitoring costs are low relative to their marginal benefits, $\frac{\partial M}{\partial NP}$ lies near zero; monitoring is more effective. I therefore refer to $\frac{\partial M}{\partial NP}$ as marginal monitoring costs in the discussions that follow.

3.4.2 *Equilibrium conditions when compensation bundles include employer stock*

An employee who receives the equilibrium compensation bundle described in the previous section (point g in Figure 7b) shirks and consumes more on the job than if monitoring were costless and perfect. The employee could reach a preferred position at less cost to the owner-manager by forgoing some shirking in exchange for additional wages (the compensation bundles lying between U_{ci} and $ELPC_{ci}$). But imperfect monitoring makes it impossible for the employee to credibly commit to such contracts. However, if employee behavior affects firm value, employee stock ownership can effect the exchange.

I now consider whether, given an equilibrium in which gains from monitoring have been exhausted, both owner-manager and worker can achieve preferred positions by including employer stock in worker compensation packages. I perturb the previous equilibrium by substituting a fraction (α) of the employing firm's equity ($V(\mathcal{E})$) for a portion of the employee's fixed wages (ΔW).²¹ The substitution makes pecuniary compensation, in addition to being a function of owner-manager expectations of

²¹While ΔW and $\alpha V(\mathcal{E})$ can be chosen such $\alpha V(\mathcal{E}) = \Delta W$, they need not be. Chaplinsky, et. al [1998] observe compensation changes at the time of ESOP adoption that range from work-rule changes to large reductions in cash wages. By not restricting the compensation given up by employees to a specific value, the model gains the flexibility to address a broad range of observed exchanges between owner-managers and employees.

employee behavior ($E[NP]$), a function of discretionary employee behavior (shirking (\mathcal{E})), where

$$P(E[NP], \mathcal{E}) = MMRP - E[NP] - M(E[NP]) - \Delta W + \alpha V(\mathcal{E}) \quad (15)$$

and

$$\frac{\partial P}{\partial \mathcal{E}} = \alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \quad (16)$$

After replacing the previous constraint (equation (8)) with the modified constraint (equation (15)), then substituting it into the worker maximization problem (7), the first order conditions under stock ownership are

$$\begin{aligned} \frac{\partial U}{\partial P} \left(-1 - \frac{\partial M(E[NP])}{\partial E[NP]} \right) + \frac{\partial U}{\partial g(NP)} &= 0 \\ \frac{\partial U}{\partial P} \frac{\alpha \partial V(\mathcal{E})}{\partial \mathcal{E}} + \frac{\partial U}{\partial g(NP)} \left(\frac{\partial \lambda}{\partial \mathcal{E}} \mathcal{E} + \lambda \right) &= 0 \end{aligned} \quad (17)$$

Solving (17) for the optimal values of \mathcal{E} and OTJ yields the identity (see Appendix 2B)

$$\left(\frac{\partial \lambda(\mathcal{E})}{\partial \mathcal{E}^s} \mathcal{E}^s + \lambda(\mathcal{E}^s) \right) \equiv \frac{\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}^s}}{\left(-1 - \frac{\partial M}{\partial NP^*} \right)}, \quad (18)$$

where \mathcal{E}^s is the utility-maximizing amount of shirking when stock is included in an employee's compensation bundle. The right-hand side of equation (18) is positive (because $\frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}$ is negative by construction and, assuming rational owner-managers, $\frac{\partial M}{\partial NP^*}$ lies between -1 and 0). This can only be the case if shirking decreases from its pre-stock-ownership level ($\mathcal{E}^s < \mathcal{E}^*$). Hence, within the constraints of this model, equation (18) implies that stock ownership decreases shirking. Intuitively, because the last few units of shirking yield little or no utility to the employee a small pecuniary gain is enough to motivate decreased shirking.

3.4.3 Estimating the decrease in the cost of shirking

The increase in firm value that results from stock ownership derives from the shirking that is forgone by employees. It is therefore reasonable to consider how factors under the control of or known to the owner-manager affect the value of the shirking forgone. Let $\Delta\mathcal{E}$ be that amount, where $\Delta\mathcal{E} > 0$. Substituting $(\mathcal{E}^* - \Delta\mathcal{E})$ for \mathcal{E}^s into the identity (18) yields

$$\left(\frac{\partial\lambda(\mathcal{E}^* - \Delta\mathcal{E})}{\partial\mathcal{E}^s} (\mathcal{E}^* - \Delta\mathcal{E}) + \lambda(\mathcal{E}^* - \Delta\mathcal{E}) \right) \equiv \frac{\alpha \frac{\partial V(\mathcal{E})}{\partial\mathcal{E}^s}}{\left(-1 - \frac{\partial M}{\partial NP^*} \right)}. \quad (19)$$

After expanding the left-hand side of equation (19) by a first-order Taylor series, the approximate amount of shirking forgone by any given worker (proof in Appendix 2C) is

$$\Delta\mathcal{E} \approx \frac{\alpha \frac{\partial V(\mathcal{E})}{\partial\mathcal{E}^s}}{\left(1 + \frac{\partial M}{\partial NP^*} \right) \left(2 \frac{\partial\lambda(\mathcal{E}, M)}{\partial\mathcal{E}^s} + \frac{\partial^2\lambda(\mathcal{E}, M)}{\partial\mathcal{E}^2} \right)}. \quad (20)$$

Shirking forgone is a function of the fraction of the firm assigned to the employee (α), marginal monitoring costs $\left(\frac{\partial M}{\partial NP} \right)$, worker preferences (the first and second derivatives of the shirking deflator with respect to shirking), and the effect of the employee's change in behavior on firm value $\left(\frac{\partial V(\mathcal{E})}{\partial\mathcal{E}} \right)$.

Figure 8 graphically depicts the equilibrating process when $\Delta W = \alpha V^0$. The relationship between pecuniary compensation and shirking forgone is represented by the ray passing through point i with origin at point g and slope $-\alpha$ (because $\frac{\partial V(\mathcal{E})}{\partial\mathcal{E}} = -1$ by the model's construction).²² I call this ray the stock ownership constraint (SOC). As the employee forgoes shirking, the value of her stock increases. Utility is maximized at point i . The employee forgoes $NP_g - NP_i$ worth of shirking for a $P_i - P_g$ increase in

²²For very small α the marginal cost/benefit ratio $\left(\frac{\partial M}{\partial NP} \right)$ must be very close to -1 before an incentive effect exists. Allowing positive externalities, where $\frac{\partial V(\mathcal{E})}{\partial\mathcal{E}} < -1$, mitigates this problem.

the value of her stock. Her utility increases from U_{ci} to U_i . The total value of the firm's stock increases by $\Delta NP = NP_g - NP_i$, the cost of the shirking forgone.

Because of the linear approximation used to estimate shirking forgone, Figure 8 exaggerates the magnitude of these relationships. Still, the directions of the relationships are accurate in the neighborhood of the pre-stock ownership equilibrium.

3.4.4 Factors that affect shirking

The factors that influence the amount of shirking an employee will forgo are either fixed, exogenous to the employee's decision, or both. The employee's ability to affect firm value ($\frac{\partial V}{\partial \varepsilon}$) is fixed by construction, though I do consider the effect of relaxing this constraint. The first and second derivatives of the shirking deflator (λ) are fixed by the Taylor series expansion. Owner-managers control the remaining two factors, marginal monitoring costs ($\frac{\partial M}{\partial NP}$) and level of partial employee ownership (α), so both are exogenous to the employee's decision.

Note that marginal monitoring costs are not affected by the decision to make employees partial owners. Because all gains from monitoring are exhausted before the stock ownership decision is made, relaxing monitoring after initiating stock ownership would be both inefficient (in that some gains from monitoring would be forgone) and counter productive (by permitting increased employee shirking). In addition, the level of monitoring is responsible for matching the firm with its worker clientele, so changing the level of monitoring implies replacing the existing work force. For these reasons, I treat stock ownership as an addition to, rather than a substitute for, monitoring.²³

²³Changing monitoring effort would change the slope of the net marginal revenue constraint at equilibrium. In turn, this implies changes in the employee's equilibrium marginal rate of substitution ($\frac{\partial U}{\partial \alpha NP}$) and hence, a different worker clientele. For those that might object to this severe interpretation, I allow the level of monitoring, and consequently the shirking deflator, to vary when considering the owner-manager's long term problem in the following section.

The following comparative statics consider the individual effects of the variables in the owner-manager's information set on employee behavior (the amount of shirking forgone). When interpreting them, it is helpful to recall that employee influence on firm value ($\frac{\partial V}{\partial \mathcal{E}}$) and the ratio $\frac{\partial M}{\partial NP}$ (marginal monitoring costs) are inverse relationships, and that both the first and second derivatives of the shirking deflator (λ) with respect to shirking are negative by design. The symbols M_{NP} and $V_{\mathcal{E}}$ are used to denote the partial derivatives $\frac{\partial M}{\partial NP}$ and $\frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}$. Differentiating $\Delta \mathcal{E}$ with respect to the variables of interest yields:

$$\frac{\partial \Delta \mathcal{E}}{\partial \alpha} = \frac{\overset{(-)}{V_{\mathcal{E}}}}{\underset{(+)}{(1+M_{NP})} \left(\underset{(-)}{2 \frac{\partial \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^2}} + \frac{\partial^2 \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^2} \right)} > 0 \quad (CS.1)$$

$$\frac{\partial \Delta \mathcal{E}}{\partial M_{NP}} = - \frac{\overset{(-)}{\alpha V_{\mathcal{E}}}}{\underset{(+)}{(1+M_{NP})^2} \left(\underset{(-)}{2 \frac{\partial \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^2}} + \frac{\partial^2 \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^2} \right)} < 0 \quad (CS.2)$$

$$\frac{\partial \Delta \mathcal{E}}{\partial V_{\mathcal{E}}} = \frac{\overset{(+)}{\alpha}}{\underset{(+)}{(1+M_{NP})} \left(\underset{(-)}{2 \frac{\partial \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^2}} + \frac{\partial^2 \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^2} \right)} < 0 \quad (CS.3)$$

These equations imply that, in the neighborhood of the pre-stock ownership equilibrium:

(CS.1) Shirking decreases (shirking forgone increases) with the level of individual employee ownership.

(CS.2) Shirking decreases (shirking forgone increases) as marginal monitoring costs increase. Intuitively, as monitoring becomes less effective (i.e., as marginal monitoring costs increase relative to the

marginal decrease in nonpecuniary compensation they induce), the marginal value of shirking to the employee decreases and he forgoes more shirking for a given level of ownership.

(CS.3) Shirking decreases (shirking forgone increases) with the employee's ability to influence firm value.

Comparative static CS.1 does not limit the gains from employee stock ownership. This implies that agency problems can be eliminated by assigning 100 percent ownership to one individual. While interesting, this result stems from the linear approximation for shirking forgone. I consider the optimal level of fractional employee ownership in the next section.

Mutual monitoring and peer pressure. The effect of peer pressure and mutual monitoring on shirking can be examined by making two additional assumptions.²⁴ First, assume that peer pressure and mutual monitoring act through the shirking deflator to reduce the utility employees derive from shirking. Define a variable PP to be an index of peer pressure that increases with the intensity of peer pressure and mutual monitoring, so that $\frac{\partial \lambda}{\partial PP} < 0$. Second, assume that peer pressure complements shirking's effect on the shirking deflator, that is, $\frac{\partial^2 \lambda}{\partial \mathcal{E} \partial PP} < 0$. Implicitly differentiating identity (18) (in which both \mathcal{E} and λ appear) with respect to peer pressure yields:²⁵

$$\frac{\partial \mathcal{E}^s}{\partial PP} = - \frac{\left(\frac{\partial \lambda(\mathcal{E}, M, PP)}{\partial PP} + \frac{\partial^2 \lambda(\mathcal{E}, M, PP)}{\partial \mathcal{E} \partial PP} \mathcal{E}^s \right)}{\left(\frac{\partial \lambda(\mathcal{E}, M, PP)}{\partial \mathcal{E}} \right)} < 0 \quad (CS.4)$$

²⁴Kandel and Lazear [1992] see peer pressure arising from two sources: internal (guilt) and external (shame). Guilt is present when an individual loses utility by his behavior in the absence of observability by others. Shame results when others observe his actions. FitzRoy and Kraft [1987] define peer pressure as social sanctions rationally applied against workers who deviate from a cooperative work norm of efficient effort-supply.

²⁵By construction, $\frac{\partial V}{\partial \mathcal{E}} = -1$, hence $\frac{\partial^2 V}{\partial \mathcal{E}^2} = 0$.

(CS.4) Shirking decreases as peer pressure and mutual monitoring increase.

Finally, it is worth observing an implied efficiency in the way that stock ownership incentives influence the employee's choice of which shirking to forgo. Just as employees consume first those factors of production that yield the greatest utility, they now reduce first consumption of those factors that promise the greatest increase in firm value per unit of utility lost.

3.5 *The owner-manager's choice*

I now consider the factors that affect the owner-manager's choice of the level of fractional employee ownership over the short and long term. Over the short term production technology is fixed. This leaves the level of employee ownership as the only decision variable available to the owner-manager. Over the long term, the ability to change production technology makes monitoring activity another choice variable. After examining the owner-manager's short- and long-term problems, I consider the total effects of individual employee ownership and marginal monitoring costs on firm value. Firm scale remains constant throughout, consistent with the model's initial assumptions.²⁶

3.5.1 *The owner-manager's decision in the short term (fixed monitoring costs)*

The owner-manager chooses the level of employee ownership that maximizes the value of her remaining shares. For N workers, the owner-manager's short-term problem is

$$\underset{\{\alpha\}}{Max} (1 - N\alpha) \left(V^0 + \sum_{i=1}^N \Delta \mathcal{E}_i \right) + N \Delta W \quad (21)$$

²⁶Allowing firm scale to vary (in particular, the number of employees) introduces a third choice variable to the long-term problem. The result is virtually intractable math that yields ambiguous implications.

where

- α = the fraction of individual employee ownership,
 N = the number of employees that are partial owners,
 V^0 = the value of the firm prior to employee ownership,
 $\Delta \mathcal{E}_i$ = $\frac{\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{(1 + \frac{\partial M}{\partial N P^*}) (2 \frac{\partial \lambda_i(\mathcal{E})}{\partial \mathcal{E}} + \frac{\partial^2 \lambda_i(\mathcal{E})}{\partial \mathcal{E}^2})}$, $\forall i = 1, \dots, N$, and
 ΔW = the value of the compensation forgone by each worker.

Solving the first order condition for the optimal level of individual employee ownership (derived in Appendix 2D) yields²⁷

$$\alpha^s = \frac{1}{2N} - \frac{V^0 (1 + \frac{\partial M}{\partial N P^*})}{2N \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}, \quad (22)$$

where

$$\bar{k} = \frac{1}{N} \sum_{i=1}^N \frac{1}{\left(2 \frac{\partial \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}_i} + \frac{\partial^2 \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}_i^2} \right)}.$$

In the short run, optimal fractional ownership is a function solely of firm attributes evaluated in the neighborhood of the pre-stock-ownership equilibrium. This makes sense. These attributes comprise the information set upon which owner and employee base their decisions. I treat them as exogenous independent variables when analyzing their short-term cross-sectional effects on the optimal choice of fractional employee ownership. As before, M_{NP^*} and $V_{\mathcal{E}}$ are used to denote the partial derivatives $\frac{\partial M}{\partial N P^*}$ and $\frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}$; both are negative. By construction, $\bar{k} < 0$ because $\frac{\partial \lambda_i(\mathcal{E})}{\partial \mathcal{E}} < 0$ and $\frac{\partial^2 \lambda_i(\mathcal{E})}{\partial \mathcal{E}^2} < 0$. The comparative statics follow.

²⁷Because N is fixed in the short-term, maximizing firm value with respect to α or $N\alpha$ yield essentially the same result. The solution to maximizing firm value with respect to $N\alpha$ is $N\alpha^s = \frac{1}{2} - \frac{V^0 (1 + \frac{\partial M}{\partial N P^*})}{2 \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}$, equation (22) multiplied by N .

$$\frac{\partial \alpha^s}{\partial M_{NP^*}} = - \frac{\overset{(+)}{V^0}}{\underset{(+)}{2NV_{\varepsilon} \bar{k}}} < 0 \quad (CS.5)$$

$$\frac{\partial \alpha^s}{\partial V^0} = - \frac{\overset{(+)}{(1 + M_{NP^*})}}{\underset{(+)}{2NV_{\varepsilon} \bar{k}}} < 0 \quad (CS.6)$$

$$\frac{\partial \alpha^s}{\partial V_{\varepsilon}} = \frac{\overset{(+)}{V^0} \overset{(+)}{(1 + M_{NP^*})}}{\underset{(-)}{2NV_{\varepsilon}^2 \bar{k}}} < 0 \quad (CS.7)$$

(CS.5) Fractional employee ownership is larger the greater are marginal monitoring costs. (Less effective monitoring leads to greater employee ownership.)

(CS.6) Fractional employee ownership is smaller the greater a firm's pre-stock ownership equilibrium value. (Because the owner-manager gives more away.)

(CS.7) Fractional employee ownership is larger the greater the employee's ability to affect firm value.

3.5.2 The owner-manager's decision over the long term (variable monitoring costs)

Over the long term, employee self-monitoring may allow an owner-manager to reduce her monitoring activities. But reduced monitoring decreases marginal monitoring costs ($\frac{\partial M}{\partial NP}$ becomes less negative) and thereby diminishes stock-ownership's incentive effect. Further, reduced monitoring increases the value of shirking to the employee ($\frac{\partial \lambda}{\partial M} < 0$), so he will shirk more. And because monitoring was optimized prior to initiating employee stock ownership, the pre-stock-ownership value of the firm (V^0) decreases. These additional functional relationships produce a considerably more

complex solution to the owner-manager's problem. Finally, as previously noted, changing monitoring implies replacing a firm's existing work force. Assuming that this can be done without cost, and holding scale constant as before, the long-term problem is

$$\underset{\{\alpha, M\}}{Max} (1 - N\alpha) \left(V^0 + \sum_{i=1}^N \Delta \mathcal{E}_i \right) + N\Delta W \quad (23)$$

where,

- α = the level of individual employee ownership,
- M = total monitoring costs,
- N = the number of employees that are partial owners,
- V^0 = the value of the firm prior to employee ownership,
- $\Delta \mathcal{E}_i$ = $\frac{\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{(1 + \frac{\partial M}{\partial NP}) \left(2 \frac{\partial \lambda_i(\mathcal{E})}{\partial \mathcal{E}} + \frac{\partial^2 \lambda_i(\mathcal{E})}{\partial \mathcal{E}^2} \right)}$, and
- ΔW = the value of the compensation forgone by each worker.

Substituting $\frac{N\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{(1 + \frac{\partial M}{\partial NP})} \bar{k}$ for $\sum_{i=1}^N \Delta \mathcal{E}_i$ as before, the problem can be restated as

$$\underset{\{\alpha, M\}}{Max} (1 - N\alpha) \left(V^0 + \frac{N\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{(1 + \frac{\partial M}{\partial NP})} \bar{k} \right) + N\Delta W \quad (24)$$

with first order conditions

$$\begin{aligned} \frac{\partial V^0}{\partial M} (1 - N\alpha) + \frac{N\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{(1 + \frac{\partial M}{\partial NP})} \frac{\partial \bar{k}}{\partial M} - \frac{N\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}{(1 + \frac{\partial M}{\partial NP})^2} \frac{\partial M_{NP}}{\partial M} - \frac{\frac{N \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}{(1 + \frac{\partial M}{\partial NP})} - N(V^0) - \frac{2N^2\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}{(1 + \frac{\partial M}{\partial NP})}}{(1 + \frac{\partial M}{\partial NP})} &= 0 \\ \frac{\partial V^0}{\partial M} (1 - N\alpha) + \frac{N\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{(1 + \frac{\partial M}{\partial NP})} \frac{\partial \bar{k}}{\partial M} - \frac{N\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}{(1 + \frac{\partial M}{\partial NP})^2} \frac{\partial M_{NP}}{\partial M} - \frac{N^2\alpha^2 \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}{(1 + \frac{\partial M}{\partial NP})} \frac{\partial \bar{k}}{\partial M} + \frac{N^2\alpha^2 \bar{k} \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{(1 + \frac{\partial M}{\partial NP})^2} \frac{\partial M_{NP}}{\partial M} &= 0 \end{aligned} \quad (25)$$

Solving for the optimal choices α^* and M^* , equating the first order conditions, then implicitly differentiating the resulting identity with respect to the variables of interest produces the following relationships.²⁸

$$\frac{\partial \alpha^*}{\partial M_{NP}} = \frac{1}{(1 + M_{NP})} \frac{\bar{k} + \alpha^* \left\{ -2N\bar{k} - (1 - N\alpha^*) \left[\frac{\partial \bar{k}}{\partial M} - \frac{2\bar{k}}{(1 + M_{NP})} \frac{\partial M_{NP}}{\partial M} \right] \right\}}{\left\{ \bar{k} \left(-2N + \frac{\partial M_{NP}}{\partial M} \frac{1}{(1 + M_{NP})} \right) - \frac{\partial \bar{k}}{\partial M} + \frac{\partial V^0}{\partial M} \frac{(1 + M_{NP})}{V_c} + 2N\alpha^* \left(\frac{\partial \bar{k}}{\partial M} - \frac{\partial M_{NP}}{\partial M} \frac{\bar{k}}{(1 + M_{NP})} \right) \right\}} \quad (CS.8)$$

$$\frac{\partial \alpha^*}{\partial V^0} = \frac{(1 + M_{NP})}{(V_c) \left\{ \bar{k} \left(-2N + \frac{\partial M_{NP}}{\partial M} \frac{1}{(1 + M_{NP})} \right) - \frac{\partial \bar{k}}{\partial M} + \frac{\partial V^0}{\partial M} \frac{(1 + M_{NP})}{V_c} + 2N\alpha^* \left(\frac{\partial \bar{k}}{\partial M} - \frac{\partial M_{NP}}{\partial M} \frac{\bar{k}}{(1 + M_{NP})} \right) \right\}} \quad (CS.9)$$

$$\frac{\partial \alpha^*}{\partial V_c} = \frac{1}{(V_c)} \frac{-\bar{k} + \alpha^* \left\{ (1 - N\alpha^*) \frac{\partial \bar{k}}{\partial M} + N\bar{k} \left[2 - \frac{(1 - \alpha)}{(1 + M_{NP})} \frac{\partial M_{NP}}{\partial M} \right] \right\}}{\left\{ \bar{k} \left(-2N + \frac{\partial M_{NP}}{\partial M} \frac{1}{(1 + M_{NP})} \right) - \frac{\partial \bar{k}}{\partial M} + \frac{\partial V^0}{\partial M} \frac{(1 + M_{NP})}{V_c} + 2N\alpha^* \left(\frac{\partial \bar{k}}{\partial M} - \frac{\partial M_{NP}}{\partial M} \frac{\bar{k}}{(1 + M_{NP})} \right) \right\}} \quad (CS.10)$$

Additional assumptions are required to sign these relationships. As before, \bar{k} is negative. The expression $(1 - N\alpha^*)$ will be positive so long as the owner-manager retains any interest in her firm. The term $\frac{\partial V^0}{\partial M}$ is positive because reduced monitoring decreases V^0 . The expression $\frac{\partial M_{NP}}{\partial M}$ may be decomposed and signed as follows.

$$\frac{\partial M_{NP}}{\partial M} = \frac{\partial}{\partial M} \left(\frac{\partial M}{\partial NP} \right) = \frac{\partial}{\partial M} \left(\frac{\partial NP}{\partial M} \right)^{-1} = - \left(\frac{\partial NP}{\partial M} \right)^{-2} \left(\frac{\partial^2 NP}{\partial M^2} \right) < 0.$$

As monitoring increases it becomes marginally less effective, a result that follows from the assumption of a convex monitoring cost function.

This leaves signing $\frac{\partial \bar{k}}{\partial M}$. Evaluating the partial derivative,

$$\frac{\partial \bar{k}}{\partial M} = \frac{\partial}{\partial M} \left(\frac{1}{N} \sum_{i=1}^N \frac{1}{\left(2 \frac{\partial \lambda_i(\varepsilon)}{\partial \varepsilon} + \frac{\partial^2 \lambda_i(\varepsilon)}{\partial \varepsilon^2} \right)} \right) = - \frac{1}{N} \sum_{i=1}^N \frac{\left(2 \frac{\partial^2 \lambda_i(\varepsilon)}{\partial \varepsilon \partial M} + \frac{\partial^2 \lambda_i(\varepsilon)}{\partial \varepsilon^2 \partial M} \right)}{\left(2 \frac{\partial \lambda_i(\varepsilon)}{\partial \varepsilon} + \frac{\partial^2 \lambda_i(\varepsilon)}{\partial \varepsilon^2} \right)^2} \quad (26)$$

While the denominator is unambiguously positive, the sign of the numerator cannot be determined. However, it is reasonable to assume that monitoring and shirking act in a

²⁸Note that \bar{k} is a function of the shirking deflator, λ , that in turn is a function of monitoring costs (M). But \bar{k} is independent from α .

nonseparable way to reduce the value of the shirking to the employee. Then both terms in the numerator will be negative and $\frac{\partial \bar{k}}{\partial M}$ will be positive. This means that the bracketed terms in the denominators of all 3 long-term relationships, hence the relationships themselves, are of indeterminate sign.

This difficulty is partially mitigated by recognizing that the optimal level of individual employee ownership (α^*) is an important determinant of the signs of these relationships. When α^* is very small, the term $\left[2N\alpha^* \left(\frac{\partial \bar{k}}{\partial M} - \frac{\partial M_{NP}}{\partial M} \frac{E}{(1+M_{NP})} \right) \right]$ inside the brackets in the denominators will be very small. Likewise, the negative term $\left[\frac{\partial V^0}{\partial M} \frac{(1+M_{NP})}{V_E} \right]$ will likely be small, because M_{NP} must approach -1 for stock ownership to be effective. Of the remaining two terms inside the brackets, the term $\left[\bar{k} \left(-2N + \frac{\partial M_{NP}}{\partial M} \frac{1}{(1+M_{NP})} \right) \right]$ is quite large and positive and will likely dominate the other term, $\left[\frac{\partial \bar{k}}{\partial M} \right]$. This makes the entire bracketed term positive. Similarly, the numerator of *CS.8* is negative and the numerator of *CS.10* is positive for low levels of individual ownership. The numerator of *CS.9* is unambiguously positive. Therefore, for sufficiently low levels of individual employee ownership, the long-term relationships are all negative, as was the case in the short-term decision. Considering that an ESOP with 25,000 participants that owns 15 percent of its parent's firm bestows an average level of individual ownership of 0.000006, this is not an unreasonable assumption. It is also likely to be consistent with the limits imposed by the Taylor series expansion.

3.6 *Factors that affect firm value*

Having determined the interaction between the level of employee ownership and monitoring in the owner-manager's long-term problem, the total effects of employee ownership and marginal monitoring costs on the value of the owner-manager's remaining

share can now be examined. I first consider the effects of a fair exchange of stock for wages ($\alpha V^0 = \Delta W$), then those of an unfair exchange ($\alpha V^0 > \Delta W$).

Firm value prior to the exchange of stock for wages is V^0 . The owner-manager exchanges $N\alpha V^0$ for $N\Delta W$ and gains $(1 - N\alpha)\Sigma\Delta\mathcal{E}_i$ from reduced shirking. This makes the post-exchange value of her remaining share

$$\begin{aligned} FV_{\text{fair}} &= V^0 - N\alpha V^0 + N\Delta W + (1 - N\alpha)\Sigma\Delta\mathcal{E}_i \\ &= V^0 + (1 - N\alpha)\Sigma\Delta\mathcal{E}_i. \end{aligned}$$

The effects of the level of employee ownership and marginal monitoring costs on the owner-manager's claim are

$$\begin{aligned} \frac{d(FV_{\text{fair}})}{d\alpha} &= (1 - 2N\alpha) \frac{NV_{\mathcal{E}}\bar{k}}{(1 + M_{NP^*})} & (CS.11) \\ &+ - (1 - N\alpha) \frac{N\alpha V_{\mathcal{E}}\bar{k}}{(1 + M_{NP^*})^2} \frac{\partial M_{NP^*}}{\partial \alpha} > 0 \end{aligned}$$

$$\begin{aligned} \frac{d(FV_{\text{fair}})}{dM_{NP^*}} &= (1 - 2N\alpha) \frac{NV_{\mathcal{E}}\bar{k}}{(1 + M_{NP^*})} \frac{\partial \alpha}{\partial M_{NP^*}} & (CS.12) \\ &+ - (1 - N\alpha) \frac{N\alpha V_{\mathcal{E}}\bar{k}}{(1 + M_{NP^*})^2} < 0 \end{aligned}$$

Subject to the restrictions imposed on the level of employee ownership by the previous section and on $\Delta\mathcal{E}$ by the Taylor series approximation,

(CS.11) Firm value increase with the level of fractional ownership; and

(CS.12) The increase in firm value is greater the greater are a firm's marginal monitoring costs.

But what if the exchange is not fair? Let δ be a discount factor, where $0 \leq \delta < 1$ and $\Delta W = \delta\alpha V^0$. The post-exchange value of the owner-manager's share becomes

$$\begin{aligned} FV_{\text{unfair}} &= V^0 - N\alpha V^0 + N\delta\alpha V^0 + (1 - N\alpha)\Sigma\Delta\mathcal{E}_i \\ &= V^0 - N\alpha V^0(1 - \delta) + (1 - N\alpha)\Sigma\Delta\mathcal{E}_i \end{aligned}$$

Differentiating with respect to the level of employee ownership and marginal monitoring costs yields the revised comparative statics

$$\frac{d(FV_{\text{unfair}})}{d\alpha} = - \underset{(-)}{NV^0(1 - \delta)} + (1 - 2N\alpha) \frac{\overset{(+)}{NV_{\mathcal{E}}\bar{k}}}{\underset{(+)}{(1 + M_{NP^*})}} \quad (CS.13)$$

$$+ - (1 - N\alpha) \frac{\overset{(+)}{N\alpha V_{\mathcal{E}}\bar{k}}}{\underset{(+)}{(1 + M_{NP^*})}^2} \frac{\partial M_{NP^*}}{\underset{(-)}{\partial\alpha}} > 0$$

$$\frac{d(FV_{\text{unfair}})}{dM_{NP^*}} = - \underset{(-)}{NV^0(1 - \delta)} \frac{\partial\alpha}{\underset{(-)}{\partial M_{NP^*}}} + (1 - 2N\alpha) \frac{\overset{(+)}{NV_{\mathcal{E}}\bar{k}}}{\underset{(+)}{(1 + M_{NP^*})}} \frac{\partial\alpha}{\underset{(-)}{\partial M_{NP^*}}} \quad (CS.14)$$

$$+ - (1 - N\alpha) \frac{\overset{(+)}{N\alpha V_{\mathcal{E}}\bar{k}}}{\underset{(+)}{(1 + M_{NP^*})}^2} > 0$$

For δ close to 1, the signs of the relationships remain unchanged. But as δ decreases, at some point the direction of the above relationships reverses and stock ownership decreases firm value. This latter scenario, however, violates the initial assumption of value-maximizing owner-managers.

3.7 Capturing employee surplus

As the model is currently structured, the employee receives a supplier surplus equal to the vertical distance between U_i and U_{c_i} in Figure 8. Competitive labor markets enable the owner-manager to capture most of this surplus. This is done by reducing the employee's fixed wages after determining the optimal stock level of employee ownership

(α^s). If the fixed wage is reduced too much, the employee chooses leisure or another employer; if by too little, firm value is not maximized. The solution is illustrated by Figure 9. After substituting stock for monetary wages the no-stock equilibrium wage P^* is reduced by an additional ΔP , to P_1 . The stock ownership constraint shifts down by $(1 - \alpha)\Delta P$ to SOC' . Firm value increases by ΔP , the value of the employee's shares by $\alpha\Delta P$. The employee's pecuniary compensation becomes P_2 . The new stock ownership constraint lies incrementally above point s , the point at which it would have been tangent to the employee's initial indifference curve (U_{ci}). The employee attains a level of utility incrementally higher than his original no-stock level of utility by forgoing shirking worth $NP^* - NP_s$. The owner-manager's stake increases by $(1 - \alpha)(\Delta P + \Delta \mathcal{E}) - \alpha V^0$.

3.8 *Stock ownership as a response to disequilibria*

Employee stock ownership can be a response to contracting inefficiencies that result from changes in a firm's production technology or shocks to its operating environment, particularly when the cost of changing worker clienteles is high. Consider changes in a firm's production technology that affect its monitoring ability, e.g., a move towards less centralized decision-making or an increase in research and development activity. For simplicity, let the effect on monitoring increase equilibrium marginal monitoring costs but not total monitoring costs. The slope of the net marginal revenue constraint increases (approaches 0 from below). The owner-manager's marginal rate of substitution between pecuniary and nonpecuniary compensation decreases. The result is that employees now place a higher relative value on shirking than the owner-manager. Shirking increases, causing the employee's compensation bundle to lie above the net marginal revenue constraint. In the short run the firm runs inefficiently. In the long run,

the owner-manager hires a new worker clientele, one that places a lower relative value on shirking than the current clientele. Adding stock to the compensation bundle such that the slope of the stock ownership constraint equals the current employees' marginal rate of substitution removes the employee's incentive to shirk. If the cost of changing worker clienteles is large, e.g., there is a large investment in human capital, this likely will be the preferred solution.

Consider a second scenario in which an exogenous economic shock devalues employee maximum marginal revenue products. The net marginal revenue constraint shifts downward and lies beneath the employee's compensation bundle. Once again the implications are for inefficiency in the short run and a new labor clientele in the long run. Using employee stock ownership, the firm can tailor a compensation bundle such that the stock ownership constraint lies tangent to the employee's indifference curve at his previous level of utility. If the shock is sufficiently large, the fraction of the firm required to restore equilibrium will be large, possibly leading to an employee buyout. This scenario is consistent with Chaplinsky, Niehaus, and Van de Gucht [1998], who find a relatively large number of employee buyout firms in industries that faced competition from foreign firms with lower labor costs.

3.9 Employee stock ownership when employees are risk averse

Relaxing the assumption of risk-neutral employees (T.3) adds another layer of mathematical complexity to the owner-manager's decision. Risk averse employees will require a premium to bear the risk associated with stock ownership. Appendix 3 derives an expression for this premium, then formally considers the relationships between the level of employee ownership and the risk premium, the firm's value prior to employee stock ownership, and the firm's marginal monitoring costs. The relationships of the level

of employee ownership to firm value prior to employee ownership and to the risk premium are ambiguous. But the sign of the relationship between the level of individual employee ownership and marginal monitoring costs remains positive, unchanged by the addition of risk.

3.10 Summary

Using neoclassical price theory I develop a model that unifies many of the existing explanations for the efficacy of employee stock ownership plans—monitoring and information costs, employee self-selection, alignment of employer and employee interests, peer pressure, and mutual monitoring. Production technology and organizational structure uniquely determine each firm's monitoring and information costs. In turn, monitoring and information costs determine the relative prices for pecuniary and nonpecuniary compensation. Employees self-select firms whose relative prices for pecuniary wages and shirking match the employees' preferences, at which point the marginal value of shirking is zero. Employees who then become partial owners find it in their self-interest to reduce their shirking. Employer and employee interests are aligned and firm value increased. Peer pressure and mutual monitoring further reduce the value of shirking to employees.

The above implies that firms with high marginal monitoring costs should be more likely to adopt employee stock ownership plans in an effort to increase firm value. The theory also yields two pairs of more specific implications that can be tested. The first pair consists of the negative relationship between the change in individual employee stock ownership and firm size and the positive relationship between the change in individual employee stock ownership and marginal monitoring costs. The second pair

consists of the positive relationships of changes in firm value to marginal monitoring costs and changes in individual employee ownership.

The next four chapters test these implications along with the 6 propositions developed in Chapter 2. Chapter 4 describes the data. Chapter 5 reports the results of logistic regressions that model the likelihood of adopting an ESOP. Chapter 6 tests the first pair of implications by regressing the change in employee ownership on a cross-section of firm attributes. Chapter 7 tests the second pair of implications by regressing cumulative abnormal stock price returns associated with ESOP announcements on a cross-section of firm attributes.

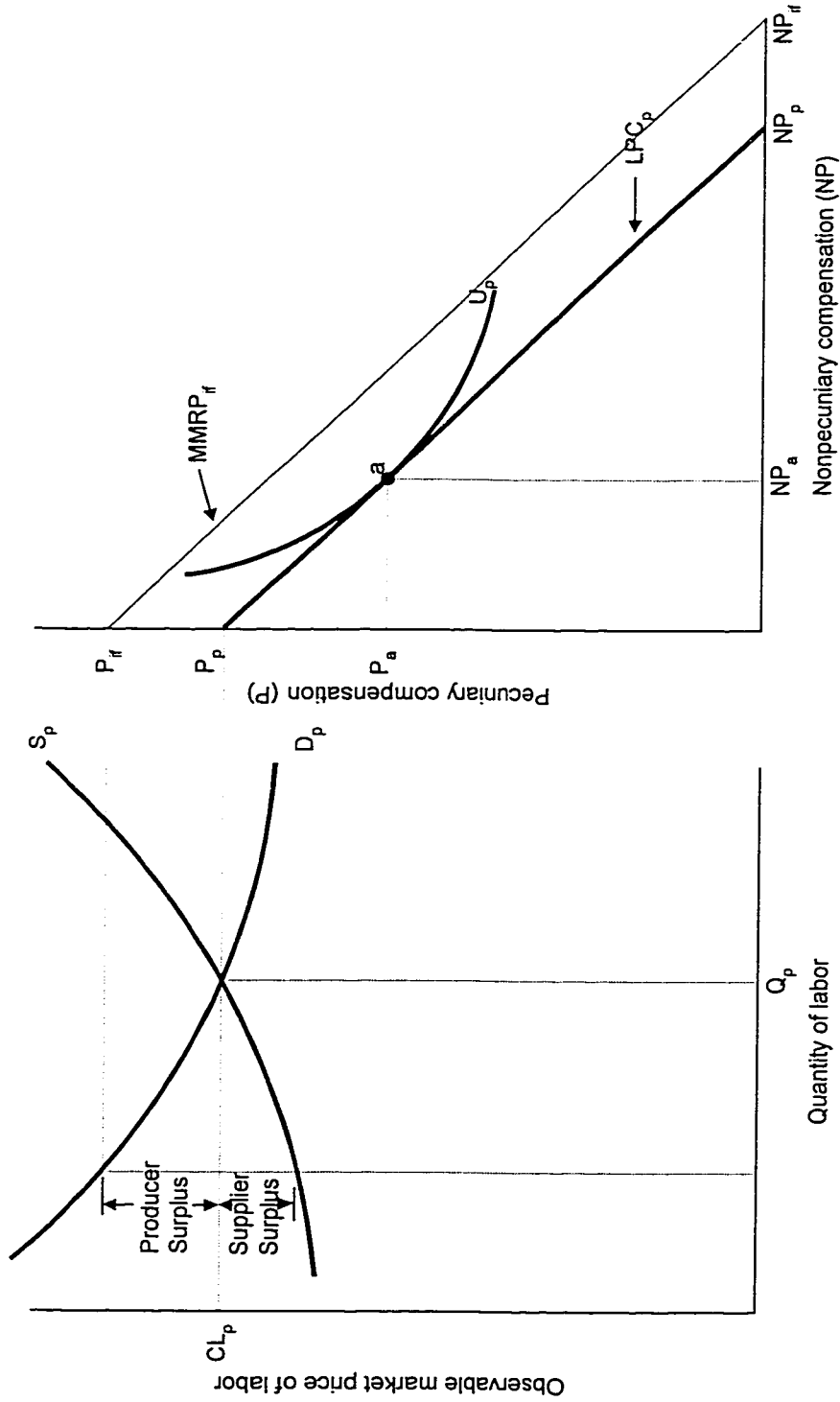


FIGURE 1a: The market price of labor (CL_p) when monitoring is costless and perfect. Indicated surpluses are for an inframarginal worker.

FIGURE 1b: The compensation bundle for an employee with preferences U_p when monitoring is costless and perfect. Also shown, the maximum marginal revenue product of an inframarginal worker, $MMRP_{if}$.

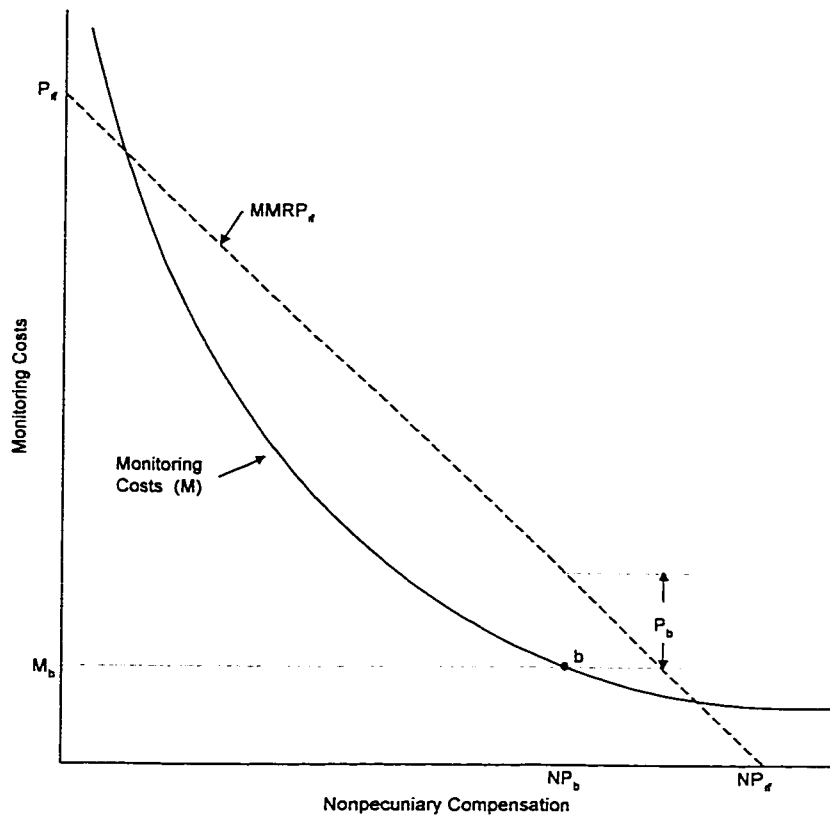


FIGURE 2: One possible monitoring cost function (M) and an inframarginal employee's maximum marginal revenue product ($MMRP_{ir}$). If the owner-manager spends nothing monitoring her employee, the employee consumes more on the job than his maximum marginal revenue product. By spending M_b on monitoring, the owner-manager restricts nonpecuniary compensation to NP_b , leaving a maximum of P_b available for pecuniary compensation.

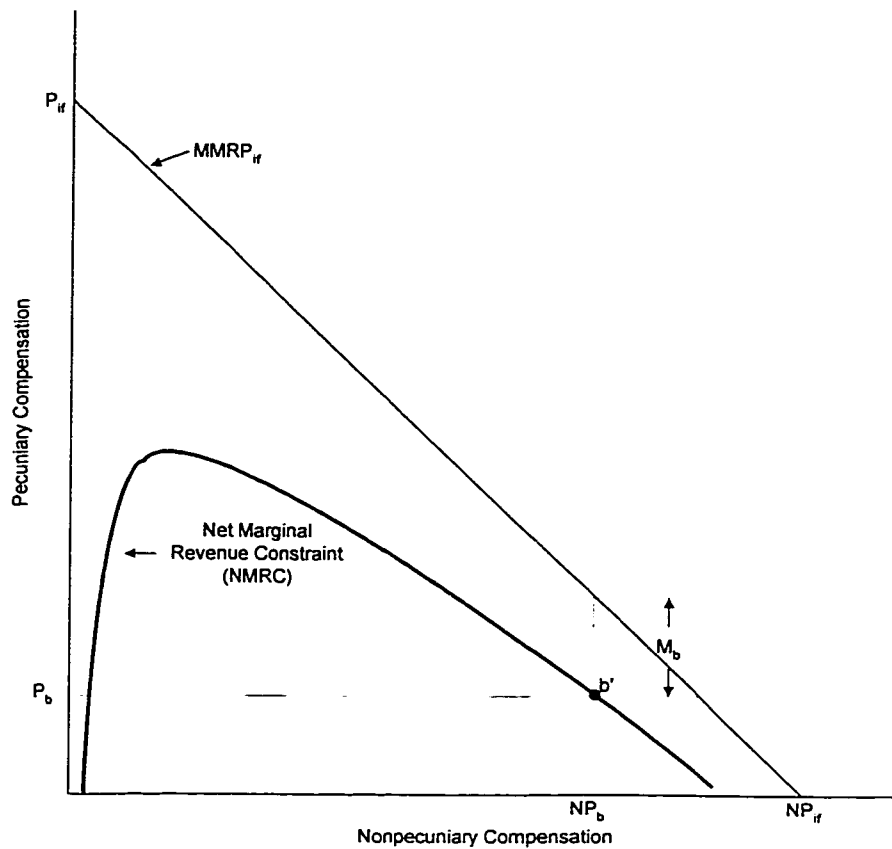


FIGURE 3: The net marginal revenue constraint: $P = \text{MMRP} - \text{NP} - M$. The net marginal revenue constraint is the zero profit iso-profit line. Point b' identifies the same information as point b in Figure 2, but in a different space. Monitoring costs (M_b) are now the vertical distance between b' and MMRP_{if} ; pecuniary compensation the vertical distance from the origin. Nonpecuniary compensation remains the horizontal distance from the origin.

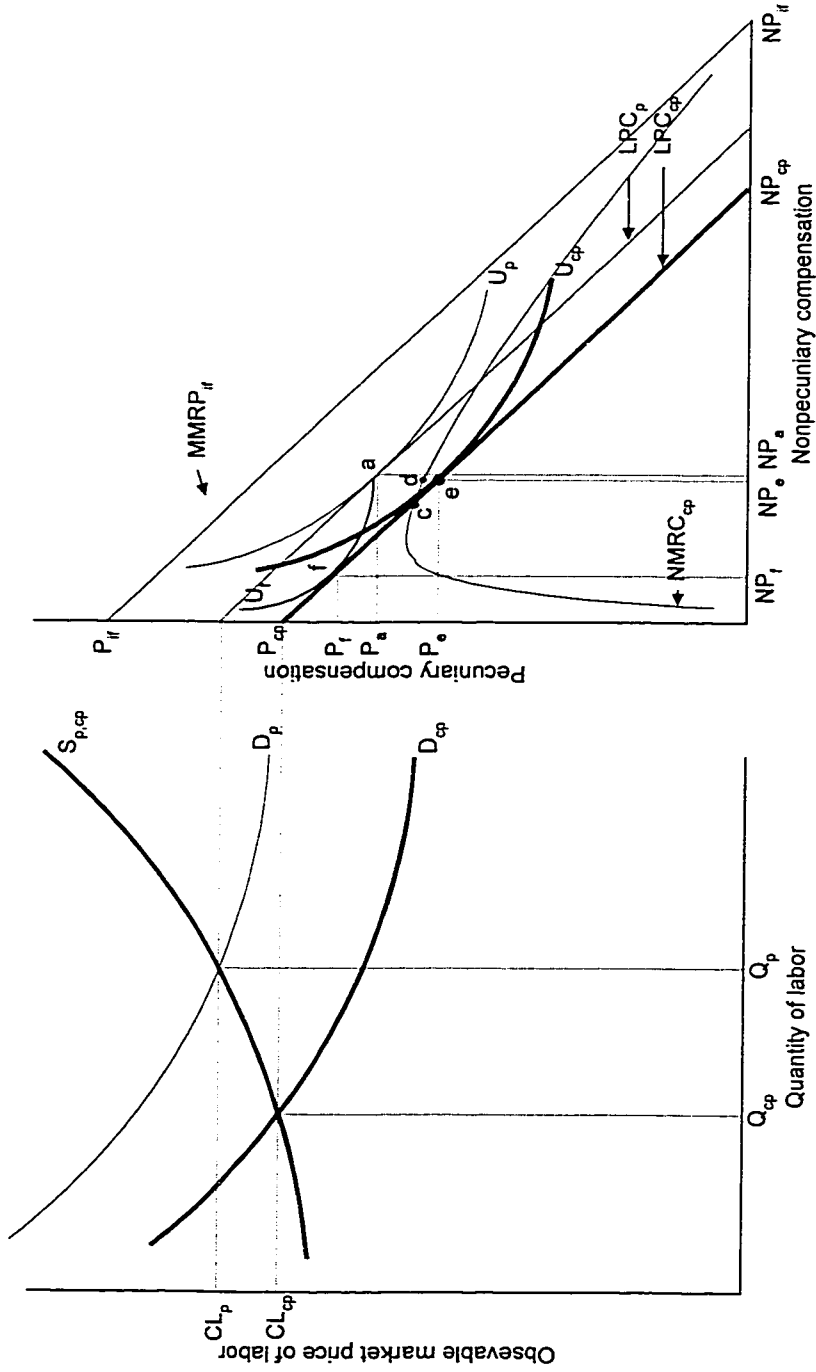


FIGURE 4a: The market price of labor when monitoring is costly and perfect. $S_{p,cp}$ is the supply schedule for labor. D_p is the demand schedule when monitoring is costless and perfect; D_{cp} the demand schedule when monitoring is costly and perfect. Costly perfect monitoring shifts the demand schedule downward from D_p to D_{cp} .

FIGURE 4b: The compensation bundle when monitoring is costly and perfect. The labor price constraint shifts down, from LPC_p to LPC_{cp} . The inframarginal employee's utility is maximized at point e .

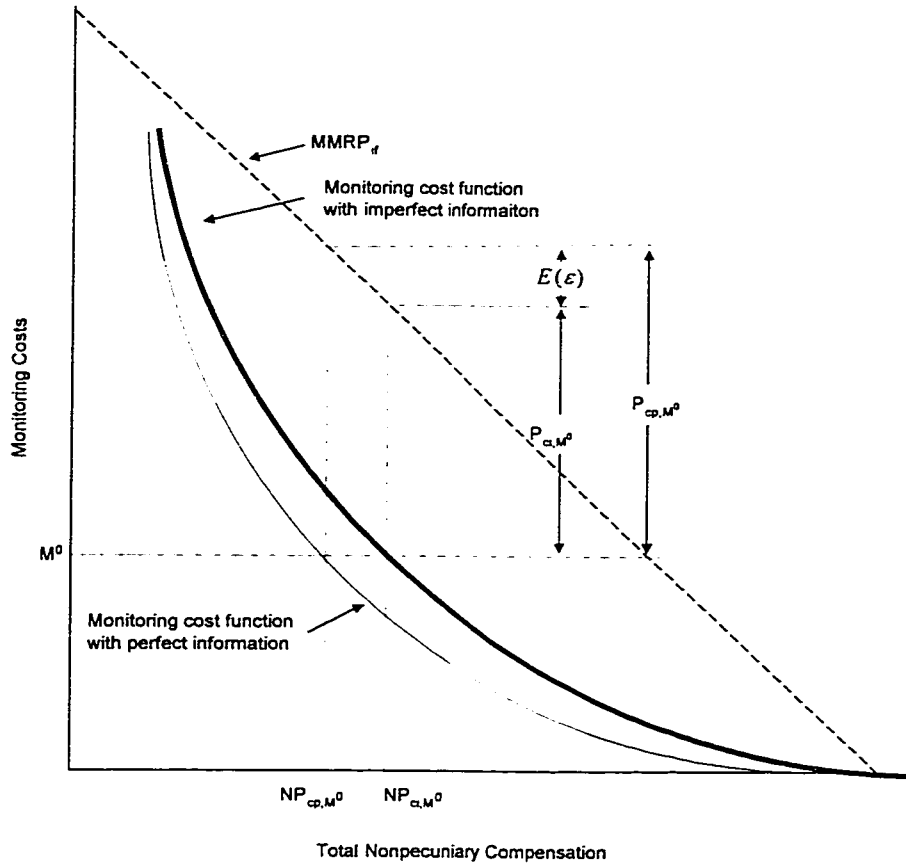


FIGURE 5: The shift in a monitoring cost function induced by the ability to shirk. For a given level of monitoring, total nonpecuniary compensation (the cost of known on-the-job consumption plus the expected cost of shirking) increases. This decreases the portion of an employee's maximum marginal revenue product available for pecuniary compensation. For example, for monitoring expenditure M^0 , the change from perfect to imperfect costly monitoring means that total nonpecuniary compensation increases from NP_{cp, M^0} to NP_{ci, M^0} , while the funds available for pecuniary compensation decrease from P_{cp, M^0} to P_{ci, M^0} .

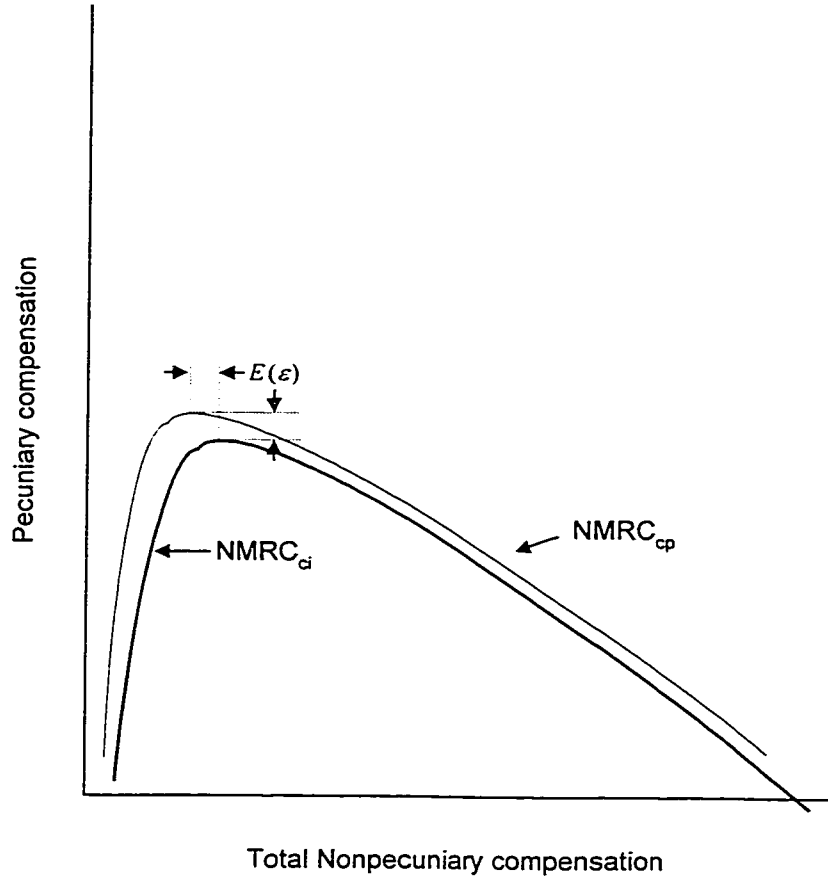


FIGURE 6: The shift in the net marginal revenue constraint induced by the ability to shirk. For a given level of monitoring, the increase in nonpecuniary compensation due to shirking reduces the amount available for pecuniary compensation by a like amount. The net marginal revenue constraint shifts diagonally downward to $NMRC_{ci}$.

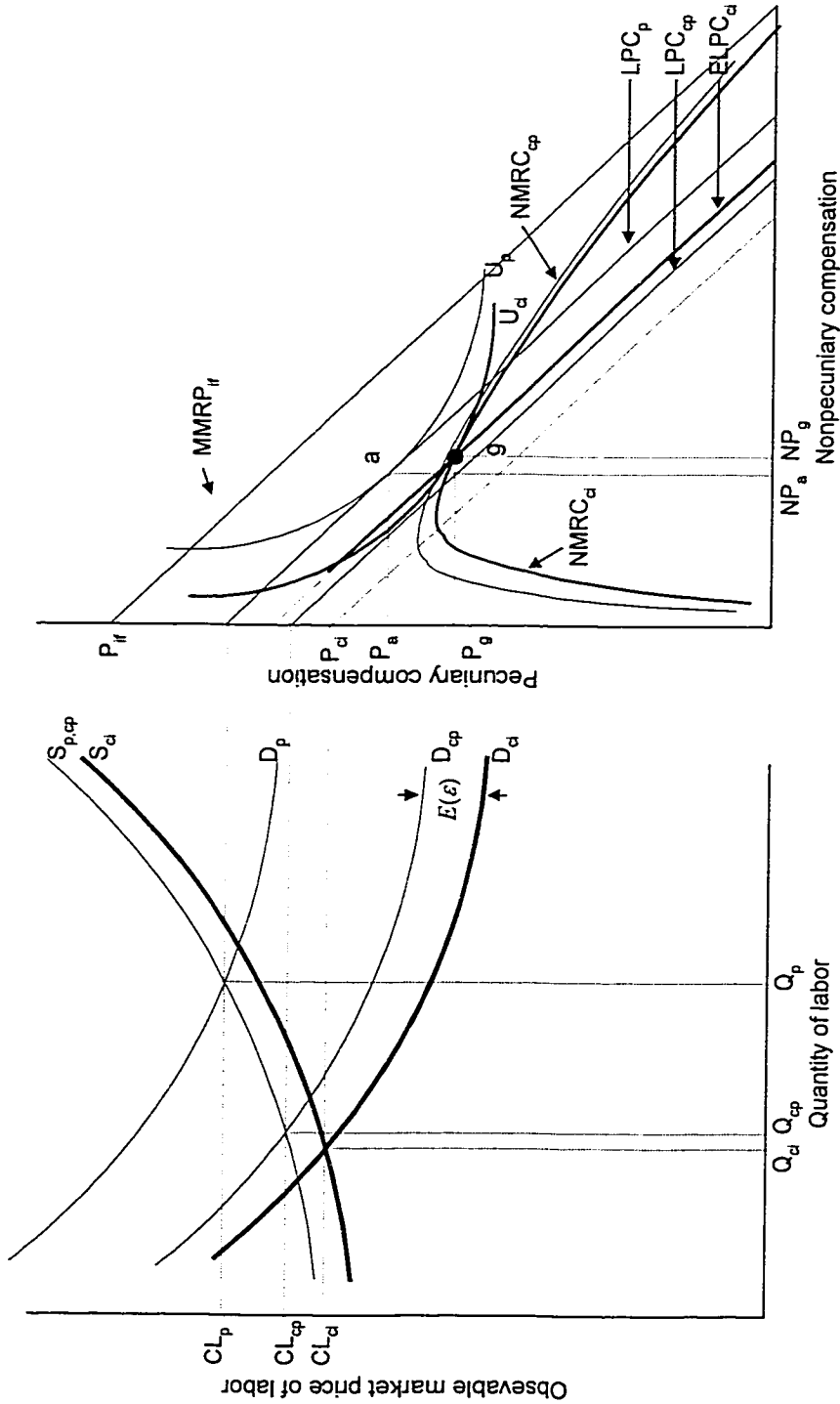


FIGURE 7a: The market price of labor when monitoring is costly and imperfect. The demand schedule shifts down by the expected cost of shirking to owner-managers, from D_{cp} to D_{ci} . The supply schedule for labor shifts down by the value of shirking to employees, from $S_{p,ep}$ to S_{ci} .

FIGURE 7b: The compensation bundle when monitoring is costly and imperfect. Reflecting both the observable market price of labor and the expected cost of shirking, the effective labor price constraint shifts out to $ELPC_{ci}$. Employee indifference curve U_{ci} is tangent to the owner-manager's net marginal revenue constraint ($NMRC_{ci}$) at point (g), where $NMRC_{ci}$ intersects $ELPC_{ci}$.

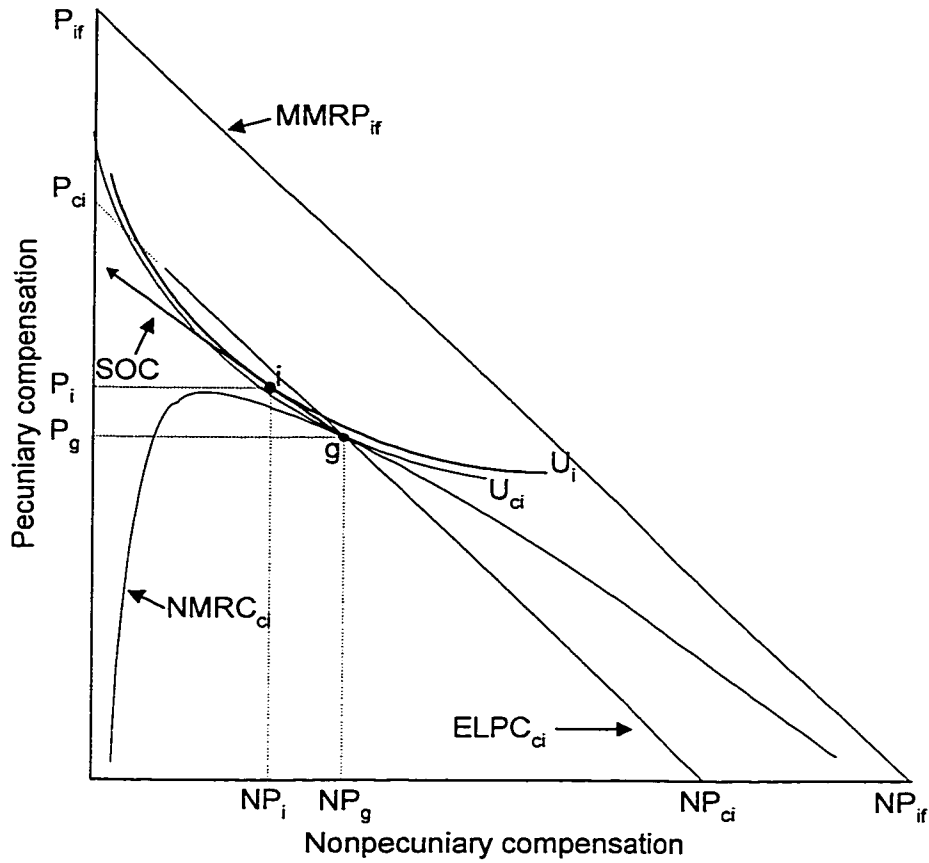


FIGURE 8: The effect of stock ownership on shirking. Ray SOC is the stock ownership constraint. After receiving stock in lieu of wages in her compensation bundle (g), the employee foregoes $NP_g - NP_i$ of worth of shirking for a gain of $P_i - P_g$ in her stock holdings. Utility increases to from U_{ci} to U_i .

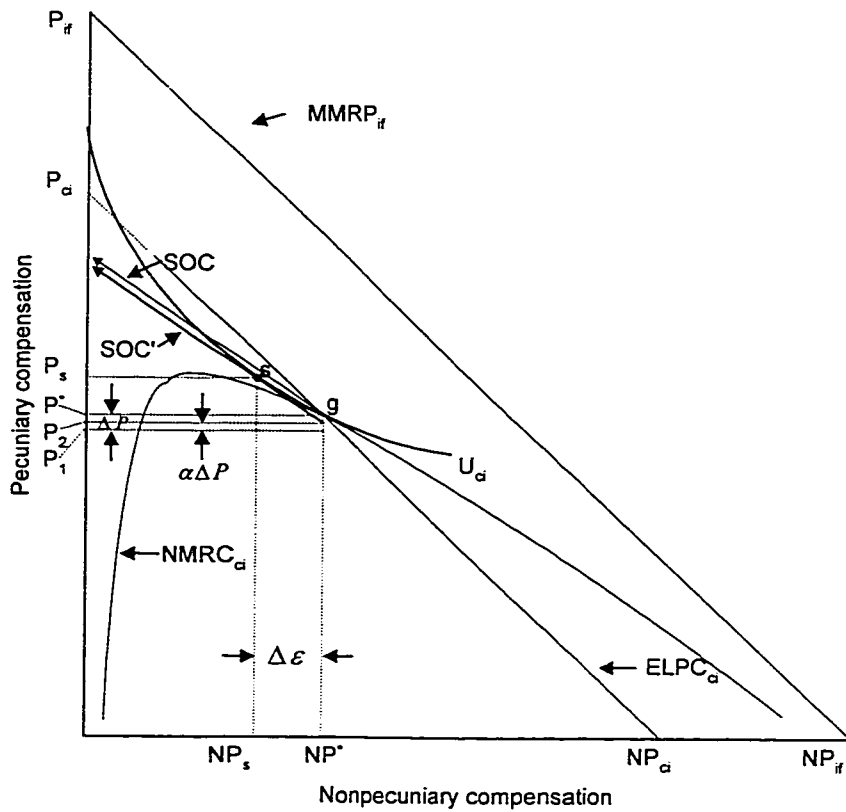


FIGURE 9: The optimal compensation bundle with stock ownership, $[NP_s, P_s]$. Fixed wages are reduced by more than the cost of stock compensation. The stock ownership constraint shifts down to SOC' . Employee attains incrementally higher utility by foregoing $NP^* - NP_s$ worth of shirking for an increase of $P_s - P^*$ in her stock holdings.

Chapter 4

4 Sampling procedure, variables, and descriptive statistics

This chapter describes sampling and data collection procedures, motivates the variables that proxy for marginal monitoring costs, tax and financing effects, and corporate control effects, and reports descriptive statistics.

I collect a sample of firms that adopt new or significantly expand existing Employee Stock Ownership Plans. Firms that adopt ESOPs are well suited for testing the implications of my model for several reasons. ESOPs are an effective tool for placing large amounts of stock into employee hands. They are also the only type of broad-based stock ownership program that enables management to unilaterally increase the amount of a firm's stock owned by its employees and simultaneously determine the magnitude of the increase. And unlike stock purchase or 401(k) plans, employees can self-select out only by changing employers.²⁹ In addition, management typically announces the plan and its size simultaneously, so that the average increase in individual employee ownership is revealed at the time the ESOP is announced and will be incorporated into the market's reaction to the announcement.

4.1 Sample selection

ESOP firms. Using tapes supplied by the Department of Labor under the Freedom of Information Act, firms with ESOPs were identified using IRS Form 5500 for the years 1986 through 1991. Firms with employee benefit plans larger than 100 participants are required to file this form each year. Firms with smaller plans must file Form 5500 every 3 years. These firms were then cross-referenced with the CRSP and

²⁹Polaroid CEO Booth explained his firm's ESOP decision thus. "We didn't have a vote; it was a dictate... It was a condition of employment." (Bruner and Brownlee [1990]).

current and research Compustat databases by CUSIP number and firm name. Those appearing in both CRSP and Compustat files between the years 1983 and 1992 were retained.

The Wall Street Journal Index, Lexus ALLNWS and SEC libraries, and Q-data microfiche proxy files were searched to identify the announcement day for each plan or significant addition, plan size, and plan type (leveraged or nonleveraged). If a press release was found, the day of the release is the event day. If no press release was found, the trading day prior to the announcement publication in the Wall Street Journal is the event day. If neither a press release nor Wall Street Journal reference was found, the event day is the filing date of the earliest SEC document that describes the plan.

Control firms. Control firms were selected by matching Compustat SIC codes and net sales. The matching algorithm first removed all firms reporting ESOP-type plans on form 5500 from the CRSP and Compustat indices. The remaining firms were then matched to ESOP-adopting firms by the following sequential protocol:

- 1) 4-digit SIC code and $\pm 10\%$ of net sales;
- 2) 4-digit SIC code and $\pm 25\%$ of net sales;
- 3) 3-digit SIC code and $\pm 10\%$ of net sales;
- 4) 3-digit SIC code and $\pm 25\%$ of net sales;
- 5) 2-digit SIC code and $\pm 25\%$ of net sales.

When more than one firm met these criteria, those with annual sales closest to the ESOP firm were selected. If none of these criteria were met the ESOP firm was dropped from the sample. To ensure as many matched pairs as possible with observations on all variables, up to three control firms were kept for each ESOP firm.

Officer and director beneficial ownership information was gathered, where possible, from Compact Disclosure. Anderson and Lee [1997] find regressions using data taken from Compact Disclosure generate results that are statistically indistinguishable from results using data taken directly from proxy statements. Some observations in Compact Disclosure contained incomplete or questionable information. For these and the firms in my sample not covered by Compact Disclosure, ownership information was gathered from proxy statements found in either Lexus SEC or Q-Data microfiche files.

The Wall Street Journal Index and Lexus ALLNWS and SEC databases were searched to determine the presence of takeover threats or rumors and the initiation of anti-takeover plans during the two years prior to the adoption decision. All data predate the plan's announcement date.

The final sample consists of 56 firms that either initiated or significantly increased the size of existing leveraged ESOPs, 28 firms that initiated nonleveraged ESOPs, 3 firms that initiated unidentified types of ESOPs, and 111 control firms that neither sponsored nor had an existing ESOP during the sampling period.

4.2 Variables

4.2.1 Monitoring efficiency and incentive-related variables

Tests of the theory developed in Chapter 3 require some measure of a firm's marginal monitoring costs, an attribute that cannot be directly observed. In considering proxies for marginal monitoring costs, I look for firm attributes that imply rapidly increasing monitoring costs for small reductions in nonpecuniary compensation. It is likely that a firm will have exhausted the benefits from monitoring if a significant contributor to firm value is difficult or impossible to observe. The contribution of intangible assets and intellectual effort to firm value meet this criterion. I select three

variables that should reflect or be highly correlated with the degree to which firm value depends upon unobservable employee behavior or intangible assets. They are the ratio of market-to-book value of equity, Tobin's Q , and research and development intensity.

The ratio of market-to-book value of equity and Tobin's Q capture the relative value of a firm's intangible assets. The market value of a firm's equity can be thought of as the sum of the present values of future cash flows from assets in place and projects yet to be undertaken. Tobin's Q , the ratio between a firm's market value and the cost of replacing its physical assets, represents a way to measure the economic contribution of intellect (Quinn [1994]).

Because market-to-book ratio and Tobin's Q rely on the market's assessment of firm value, they are at best very noisy proxies. So I also use an accounting-based variable, research and development intensity, to proxy for monitoring costs. Kruse [1996] argues that research and development intensity represents the contributions of innovation and collaboration to firm value.³⁰ Clyde and James [1994] argue that research and development intensity captures the gains to be realized from investing in human capital. The greater the required investment in human capital, the greater should be the difficulty in monitoring an employee's work effort. I calculate research and development intensity in two ways: as research and development expense either per employee or per net sales.

As these three proxies increase in value, marginal gains from monitoring are more likely to be exhausted, marginal monitoring costs more likely to approach benefits, and the ratio $(\frac{\partial M}{\partial NP})$ more likely to approach its rational limit of -1 . Hence, these variables will be positively correlated with marginal monitoring costs.

³⁰Kruse includes an R&D variable in his logit regressions because "group incentives may be particularly useful in motivating innovation and collaboration represented in much R&D work."

Employee productivity may also affect the ESOP decision and the market's reaction to it. Firms with highly productive employees may have little need to implement additional incentives and will therefore be less likely to adopt an ESOP. The effect of employee productivity on firm value, conditional on having adopted an ESOP, is ambiguous. If employees are more productive because they shirk less (perhaps reflecting a corporate culture in which peer pressure is an important factor), additional incentives likely will be redundant and have little effect on firm value. But if employees are more productive because of their firm's production technology, the incentive effect will be leveraged and firm value should increase. Because capital complements worker productivity, its intensity proxies for employee ability to influence firm value (Kruse [1993]). I use capital intensity, defined as gross property, plant and equipment per employee, to control for employee productivity effects.

4.2.2 Tax and financing variables

I use three variables to capture different aspects of ESOP tax and financing benefits: a firm's tax exposure, the presence of a net operating loss carryforward, and a firm's debt-to-equity ratio. First, firms must have taxable earnings to benefit from ESOP tax incentives; the relatively greater the earnings that are exposed to taxation, the greater the potential benefit. To capture this effect I use the percentage of a firm's operating income exposed to taxation (tax exposure), defined as the ratio of operating income less interest, depreciation and amortization expense to operating income. Second, a firm must have positive earnings to benefit from any tax deduction. Following Beatty [1994], I use the presence of a net operating loss carryforward to indicate a firm's inability to use additional tax shields. Third, firms with higher borrowing costs may find ESOP loans relatively more attractive than other firms (Beatty [1994]). So, again following Beatty

[1994], I include the ratio of a firm's book value of debt to market value of equity in each model.

4.2.3 Voting control variables

I adapt Chaplinsky and Niehaus' [1994] voting-control variables to capture nonlinearities in the relationship between insider ownership and the likelihood of ESOP adoption and between insider ownership and announcement period abnormal returns.³¹ Following Chang and Mayers [1992], I assume employee-owned shares will be voted with management's desires and define beneficial insider ownership to include both direct officer and director ownership and significant stock holdings by existing employee benefit plans. Let INOWN be the percentage of beneficial insider ownership prior to announcing an ESOP, and let P_1 and P_2 be arbitrarily defined partitioning ownership levels. Then VOTE $_j$ is defined thus:

$$\begin{aligned}
 \text{VOTE1} &= \text{INOWN} && \text{if} && \text{INOWN} < P_1 \\
 &= P_1 && \text{if} && \text{INOWN} \geq P_1 \\
 \text{VOTE2} &= 0 && \text{if} && \text{INOWN} < P_1 \\
 &= \text{INOWN} - P_1 && \text{if} && P_1 \leq \text{INOWN} < P_2 \\
 &= P_2 - P_1 && \text{if} && \text{INOWN} \geq P_2 \\
 \text{VOTE3} &= 0 && \text{if} && \text{INOWN} < P_2 \\
 &= \text{INOWN} - P_2 && \text{if} && \text{INOWN} \geq P_2 .
 \end{aligned}$$

The result is a piece-wise regression with connected individual segments.

While the level of insider ownership prior to adopting an ESOP likely affects the decision to adopt, the market will be more interested in how an ESOP changes the level

³¹ Similar methods are used by Chang and Mayers [1992] and Wruck [1989].

of managerial control. Following Chaplinsky and Niehaus [1994], I calculate the voting control segments twice, with and without new ESOP shares, then subtract the latter from the former. The differenced variables are then used in the cross-sectional regressions on cumulative abnormal stock price returns.

No reason exists *a priori* for determining the values of P_1 and P_2 , or for that matter, whether two break point are sufficient. Chaplinsky and Niehaus [1994] use two (10 and 25%). Chang and Mayers [1992] segment their ownership data by 10 percent increments (10, 20, 30, and 40%). I estimate models using three sets of break points: {5,15}, {10,25}, and {5,15,25}. All yield similar results. I report my findings for the break points {10,25}.

Because ESOPs can be powerful takeover defenses (Bhagat and Jefferies [1991], Chaplinsky and Niehaus [1994], Sokobin [1993]), I use indicator variables to control for firm takeover status and defensive posture. The variable THREAT equals one if takeover threats or rumors are present during the two years prior to adoption, else zero. The variable DEFENSE equals one if a firm implements an anti-takeover plan during the two years prior to the decision to adopt an ESOP, else zero.

4.2.4 *Miscellaneous variables*

I also control for the effects of risk, firm size, and confounding events. I use two measures of risk. Following Beatty [1994], I divide total risk into systematic and nonsystematic segments, using beta (BETA) and the root mean squared error (FRM_RMSE) from fitting the market model. I also measure total risk as the standard deviation of a firm's daily stock price return (STD_RET) over the year prior to adoption. I use the natural logarithm of the market value of a firm's equity (SIZE) for firm size. Finally, a significant number of ESOPs are announced simultaneously with the initiation

or expansion of a share repurchase plan, possibly confounding the market's reaction. I include an indicator variable (REPO) equal to one if such an announcement is made, else zero.

The variables and their definitions are summarized in Table 4, along with the formulas used to calculate them and the Compustat data field definitions.

4.3 *Descriptive statistics*

Table 5 reports descriptive statistics for four segments of the data set: leveraged ESOP adopters, nonleveraged ESOP adopters, leveraged and nonleveraged ESOP adopters combined, and control firms.

Clear differences exist between ESOP adopters and control firms. On average, firms that adopt leveraged ESOPs exhibit relatively lower Tobin's Q and assume a more active defensive posture than control firms. Firms that adopt nonleveraged ESOPs are relatively smaller, less capital intense, and have higher levels of insider ownership than control firms. Threatened firms that adopt ESOPs have lower levels of insider ownership than threatened control firms in the greater-than-25-percent ownership segment. The differences between leveraged ESOP adopters and control firms with respect to defensive posture and between threatened ESOP adopters and threatened control firms suggest that anti-takeover considerations are important to the ESOP decision.

Leveraged and nonleveraged adopting firms also differ significantly from each other. Nonleveraged adopting firms are smaller and take fewer additional defensive measures. Fewer are threatened, perhaps because insiders have relatively more voting power. Nonleveraged ESOPs also exhibit greater nonsystematic risk. Finally, the

increase in average employee ownership brought about by nonleveraged ESOPs is about 10 times less than that created by leveraged plans.

ESOP adopting firms do not differ statistically from each other nor from control firms with respect to their market-to-book ratio, research and development intensity, the presence of a net operating loss carryforward, debt to equity ratio, and tax exposure.

The results in Table 5 underscore the importance of treating leveraged and nonleveraged ESOP adopters separately. The significant differences between all ESOP adopters and control firms with respect to Tobin's Q is due to the leveraged ESOP segment. And the significant differences between nonleveraged adopters and control firms with respect to capital intensity and insider ownership vanish when both types of plan adopters are combined.

To include as much information as possible, the full sample of 87 ESOP firms was used to calculate the descriptive statistics above and the average cumulative abnormal returns reported in Chapter 7. But several considerations reduced the size of the sample used in the cross-sectional regressions that follow. In three cases, ESOPs were part of an employee buyout. Because these cases are not representative of the incremental increases in stock ownership which are the primary focus of my theory, they are deleted. In addition, because I treat leveraged and nonleveraged ESOPs separately, only firms adopting clearly identifiable ESOP types are retained. This resulted in the loss of three additional cases. Finally, eight cases were lost due to missing observations on some the variables used in the regressions. The final data set of 73 cases consists of 48 leveraged and 25 nonleveraged ESOP adopters.

Table 4: Definitions and formulas of test variables

<i>Variable</i>	<i>Definition</i>	<i>Formula¹</i>
<i>Incentive variables</i>		
Market-to-book ratio	The ratio of market to book value of equity	$(d24*d25)/(d6-d9)$
Tobin's Q	The ratio of the market to replacement value of a firm's assets ²	$(d24*d25+d9+d34+d1+d39)/d6$
Research and development intensity 1	Research and development expenses per employee	$d46/d29$
Research and development intensity 2	Research and development expenses divided by net sales	$d46/d12$
<i>Employee productivity</i>		
Capital intensity	Gross plant, property, and equipment per employee	$d7/d29$
<i>Tax variables</i>		
Tax ratio	The ratio of operating income less interest and amortization divided by operating income	$(d13-d14-d15)/d13$
Net-operating-loss carryforward	Indicator variables equal to 1 if firm reports a net operating loss carryforward, else 0	
Debt-to-equity ratio	The ratio of the book value of debt to market value of equity	$d9/(d24*d25)$
<i>Voting control variables</i>		
Beneficial insider ownership	The percentage of firm owned by its officers, directors, and employees during period before or after an ESOP is adopted	
Vote#	Segments of insider ownership excluding new ESOP shares	
Takeover status	Indicator variable equal to 1 if takeover rumors or threats are present during the two years prior to adoption, 0 otherwise	
Defensive posture	Indicator variable equal to 1 if firms adopts takeover defense (other than an ESOP) during the two years prior to adoption, 0 otherwise	

Table 4, cont.: Definitions and formulas of test variables

<i>Miscellaneous variables</i>	
Non-systematic risk	The root-mean-squared error calculated from fitting the two factor market model with partial anticipation
Systematic risk	The beta coefficient from fitting two factor market model with partial anticipation
Total risk	The standard deviation of a firm's daily stock price returns over the year prior to ESOP adoption
Size	The natural log of the market value of firm 's equity
Repurchase plan	Indicator variable equal to 1 if a stock repurchase plan is announced simultaneously with the decision to adopt an ESOP
¹ Compustat data fields used:	
d1=cash and short term investments	d25=common shares outstanding
d6=assets - total liabilities and stockholders' equity	d26=dividends per share - ex date
d7=plant, property, and equipment (gross)	d29=number of employees
d9=total long term debt	d34=debt in current liabilities
d12=net sales	d41=cost of goods sold
d13=operating income before depreciation	d46=research and development expense
d14=depreciation and amortization	d52=net operating loss carry forward -- unused portion
d15=interest expense	d189=selling, general, and administrative costs
d24=closing price - year	

²Perfect and Wiles [1994] report this measure of Q has a correlation of 0.93 with that estimated using the Lindenberg and Ross [1981] method.

TABLE 5: Descriptive statistics of level data for leveraged ESOP adopters, nonleveraged ESOP adopters, and control firms. *T*-statistics^a for the differences between sample segment means are reported for: *ac* all leveraged and nonleveraged ESOP v. all control firms; *nl* nonleveraged v. leveraged ESOP firms; *nc* nonleveraged ESOP v. all control firms; and *lc* leveraged ESOP v. all control firms.

<i>Incentive Effect Variables</i>	Mean (Standard deviation)				<i>t</i> -statistics
	All ESOP adopters	Nonleveraged ESOP adopters	Leveraged ESOP adopters	Control firms	
<i>Tobin's Q</i>					
	1.16 (0.48)	1.18 (0.52)	1.15 (0.47)	1.41 (0.10)	<i>ac</i> -2.15†**
	1.04	1.08	1.04	1.02	<i>nl</i> 0.27
	0.27 :: 2.65 (78)	0.54 :: 2.65 (26)	0.27 :: 2.44 (52)	0.31 :: 5.96 (96)	<i>nc</i> -1.59†
	1.02 (0.70)	1.03 (0.65)	1.03 (0.73)	1.23 (1.14)	<i>lc</i> -2.15†**
	0.88	0.84	0.90	0.82	<i>ac</i> -1.48†
	0.05 :: 3.74 (83)	0.09 :: 2.62 (28)	0.05 :: 3.74 (55)	0.01 :: 6.19 (104)	<i>nl</i> 0.03
<i>Market to book value of equity</i>					<i>nc</i> -1.18†
	2.19 (4.94)	2.63 (7.40)	1.93 (3.03)	2.60 (5.20)	<i>lc</i> -1.36†
	0	0	0.15	0	<i>ac</i> -0.55
	0 :: 38.4 (82)	0 :: 38.4 (28)	0 :: 11.71 (54)	0 :: 22.7 (106)	<i>nl</i> 0.47†
<i>Research and development intensity 1</i>					<i>nc</i> 0.03†
	133.5 (281.1)	85.3 (179.2)	159.0 (321.0)	178.5 (308.9)	<i>lc</i> -0.98†
	43.3	31.7	47.8	47.8	<i>ac</i> -1.00
	1.90 :: 2010 (78)	1.9 :: 806.1 (27)	17.4 :: 2010 (51)	1.9 :: 1526 (100)	<i>nl</i> -1.30†
<i>Employee influence variable</i>					<i>nc</i> -2.01†**
<i>Capital intensity</i>					<i>lc</i> -0.36

TABLE 5, cont.: Descriptive statistics of level data.

	All ESOP adopters	Nonleveraged ESOP adopters	Leveraged ESOP adopters	Control firms	t-statistics
<i>Tax effect variables</i>					
Tax ratio	0.36 (0.94)	0.45 (0.54)	0.32 (1.06)	0.45 (2.55)	ac -0.32†
	0.57 -7.01 :: 1.27 (79)	0.58 -1.63 :: 1.27 (27)	0.56 -7.01 :: 0.89 (52)	0.54 -15.5 :: 18.2 (98)	nl 0.75
					nc 0.001†
					lc -0.46†
Presence of net operating loss carryforward	0.12 (0.33)	0.14 (0.36)	0.11 (0.31)	0.13 (0.34)	ac -0.22
	0 0 :: 1 (84)	0 0 :: 1 (28)	0 0 :: 1 (56)	0 0 :: 1 (108)	nl 0.47
					nc 0.18
					lc -0.42
Debt to equity ratio	0.52 (0.67)	0.47 (0.67)	0.55 (0.67)	0.54 (1.10)	ac -0.16†
	0.20 0 :: 2.72 (83)	0.19 0 :: 2.49 (28)	0.27 0 :: 2.72 (55)	0.20 0 :: 9.47 (104)	nl -0.54
					nc -0.46†
					lc 0.05†

TABLE 5, cont.: Descriptive statistics of level data.

	All ESOP adopters	Nonleveraged ESOP adopters	Leveraged ESOP adopters	Control firms	t-statistics
<i>Voting control effect variables</i>					
Insider ownership 0<10% (VOTE1)	7.43 (3.70) 10 0.04 :: 10 (84)	8.63 (2.97) 10 0.21 :: 10 (28)	6.83 (3.90) 10 0.04 :: 10 (56)	6.89 (3.96) 10 0 :: 10 (108)	ac 0.96 nl 2.14** nc 2.16** lc -0.10
Insider ownership 10<25% (VOTE2)	7.44 (7.20) 4.79 0 :: 15 (84)	10.07 (6.85) 15 0 :: 15 (28)	6.12 (7.07) 1.40 0 :: 15 (56)	5.79 (6.65) 0.91 0 :: 15 (108)	ac 1.64* nl 2.43** nc 3.01*** lc 0.30
Insider ownership 25<100% (VOTE3)	9.21 (17.75) 0 0 :: 63.6 (84)	13.03 (19.56) 1.02 0 :: 58.7 (28)	7.30 (16.62) 0 0 :: 63.6 (56)	7.02 (15.75) 0 0 :: 73.3 (108)	ac 0.90 nl 1.40 nc 1.71** lc 0.11
Insider ownership when threatened 0<10% (TVOTE1)	1.95 (3.69) 0 0 :: 10 (84)	1.28 (3.27) 0 0 :: 10 (28)	2.29 (3.87) 0 0 :: 10 (56)	1.61 (3.35) 0 0 :: 10 (108)	ac 0.67 nl -1.18 nc -0.47 lc 1.16
Insider ownership when threatened 10<25% (TVOTE2)	1.72 (4.69) 0 0 :: 15 (84)	1.61 (4.72) 0 0 :: 15 (28)	1.78 (4.71) 0 0 :: 15 (56)	1.18 (3.84) 0 0 :: 15 (108)	ac 0.86 nl -0.16 nc 0.50 lc 0.87

TABLE 5, cont.: Descriptive statistics of level data.

	All ESOP adopters	Nonleveraged ESOP adopters	Leveraged ESOP adopters	Control firms	t-statistics
<i>Voting control effect variables, cont.</i>					
Insider ownership when threatened 25<100% (TVOTE3)	0.34 (1.73) 0 0 :: 10.9 (84)	0.52 (2.14) 0 0 :: 10.9 (28)	0.25 (1.49) 0 0 :: 10.8 (56)	2.24 (9.72) 0 0 :: 62.5 (108)	ac -1.99†** nl 0.67 nc -1.69†* lc -2.08†**
Insider ownership	23.76 (24.67) 14.79 0.04 :: 88.6 (84)	31.40 (25.36) 25.84 0.21 :: 83.7 (28)	19.94 (23.63) 11.40 0.04 :: 88.6 (56)	19.57 (22.76) 10.91 0 :: 98.3 (108)	ac 1.22 nl 2.05** nc 2.39** lc 0.10
Defensive measures taken during two years prior to ESOP adoption	0.33 (0.47) 0 0 :: 1 (84)	0.14 (0.36) 0 0 :: 1 (28)	0.43 (0.50) 0 0 :: 1 (56)	0.24 (0.43) 0 0 :: 1 (108)	ac 1.42 nl -3.01†*** nc -1.11 lc 2.51***
Takeover threat present during two years prior to ESOP adoption	0.26 (0.44) 0 0 :: 1 (84)	0.14 (0.36) 0 0 :: 1 (28)	0.32 (0.47) 0 0 :: 1 (56)	0.28 (0.45) 0 0 :: 1 (108)	ac -0.24 nl -1.77* nc -1.47 lc 0.58
<i>Miscellaneous variables</i>					
β from fitting market model	1.06 (0.49) 1.05 -0.25 :: 2.51 (84)	1.08 (0.52) 1.06 0.11 :: 2.51 (28)	1.05 (0.48) 1.03 -0.25 :: 2.10 (56)	1.31 (2.28) 1.05 -0.67 :: 24.0 (108)	ac -1.09† nl 0.25 nc -0.95† lc -1.12†

TABLE 5, cont.: Descriptive statistics of level data.

	All ESOP adopters	Nonleveraged ESOP adopters	Leveraged ESOP adopters	Control firms	<i>t</i> -statistics
<i>Miscellaneous variables, cont.</i>					
Root-mean-squared error from fitting market model	0.024 (0.013) 0.022 0.007 :: 0.074 (84)	0.029 (0.016) 0.025 0.007 :: 0.074 (28)	0.021 (0.009) 0.019 0.007 :: 0.045 (56)	0.044 (0.171) 0.020 0.006 :: 1.80 (108)	<i>ac</i> -1.22† <i>nl</i> 2.98†*** <i>nc</i> -0.87† <i>lc</i> -0.39†
Market value of equity in millions	606.6 (1057) 102.6 2.39 :: 5010 (84)	233.2 (515.2) 66.5 4.9 :: 2565 (28)	793.4 (1230) 289.0 2.4 :: 5100 (56)	1024.6 (2793) 162.7 1.0 :: 22911 (106)	<i>ac</i> -1.42† <i>nl</i> -2.98†*** <i>nc</i> -2.75†*** <i>lc</i> -0.73†
Average fractional ownership of employees (x 10 ⁻⁵) (α_{emp})	8.50 (3.07) 1.46 0 :: 192 (81)	1.59 (2.50) 0.58 0 :: 10.66 (27)	11.95 (33.40) 1.78 0 :: 192 (54)		<i>nl</i> -2.27†***

***, **, Significant at the 0.01, 0.05, and 0.10 levels of confidence, respectively

† Denotes unequal variances assumed when calculating *t*-statistic

^aAn *F*-test for unequal variances is performed, where $F = \left(\frac{\text{larger of } s_1^2, s_2^2}{\text{smaller of } s_1^2, s_2^2} \right) / \left(\frac{1/n_1 + 1/n_2}{1/n_1 + 1/n_2} \right)$. If the null hypothesis of equal variances is not rejected at the 0.05

level of significance, the reported *t*-statistic is $t = \left(\frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2 (1/n_1 + 1/n_2)}} \right)$. If the null is rejected, the reported *t*-statistic is

$t = \left(\frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s_1^2/n_1 + s_2^2/n_2}} \right)$ and the indicated *p*-values are estimated as per Cochran and Cox [1950].

Chapter 5

5 *Factors affecting the ESOP decision*

Chapter 2 develops four testable propositions that relate the likelihood of adopting leveraged and nonleveraged ESOPs to the more general ESOP incentive, tax, and control hypotheses. But the lack of a rigorous theory of broad-based stock ownership incentives made tests of the employee incentive hypothesis difficult to design. This motivated the theory developed in Chapter 3. The theory implies that the power of stock ownership incentives increases with a firm's marginal monitoring costs. This in turn implies that value-maximizing owner-managers of firms that have exhausted the gains from monitoring will be more likely to adopt ESOPs.

This chapter simultaneously tests the incentive hypothesis (via Proposition 1) with the tax and control hypotheses (via Propositions 2-4) using multinomial logistic regressions. The use of panel data facilitates tests from two perspectives: the regressions on level data estimate the ability of factors to predict the presence of an ESOP; those on differenced data estimate the ability of factors to predict the decision to adopt one. The results are weak. Support for the incentive and tax hypotheses depends upon model specification, while support for the control hypothesis derives only from a positive relationship between the likelihood of adoption and the presence of defensive tactics undertaken prior to initiating an ESOP.

5.1 *The multinomial logit model*

The ESOP decision is more complex than a simple binomial choice. The decisions to adopt an ESOP and which type to adopt—leveraged or nonleveraged—are made simultaneously. While the likelihood of adopting each type of plan can be modeled

individually, doing so necessitates working with smaller samples and ignores the choice of ESOP type. The multinomial logit model addresses both problems. Appendix 4 tersely develops the multinomial logit categorical choice model as it applies to the ESOP decision.

A potential drawback of the multinomial logit model is the underlying “Independence for Irrelevant Alternatives” (IIA) assumption that the log-odds of any two alternatives are independent of the attributes or availability of a third alternative (Hausman and McFadden [1984]). For example, a model of transportation choice that includes a bus and taxi as separate alternatives is consistent with the IIA assumption; one that includes a red bus and a blue bus as separate alternatives is not.³²

Hausman and McFadden [1984] develop a statistic that tests the IIA assumption. Broadly viewed, the test statistic for a k -factor model is the weighted squared distance in k -dimensional space between the maximum likelihood solutions for the full model and a model from which one alternative has been removed.³³ A significant test statistic rejects the IIA assumption and thereby implies that the alternatives are not independent. Thus, the IIA statistic tests the premise that leveraged and nonleveraged ESOPs serve different clienteles. Extending the previous analogy, I test whether leveraged and nonleveraged ESOPs are two distinct modes of transportation, e.g., buses and taxis, or merely buses of different hues.

³²The IIA assumption does not require that the model include all meaningful alternatives.

³³The weights are the differences between the estimated variances of the coefficients from the full and restricted models.

5.2 *The tests*

Incentive effects. My theory implies that, after becoming partial owners, workers will reduce their shirking more when employed by firms with greater marginal monitoring costs. Because such firms have more to gain by adopting an ESOP, they should be more likely to do so. Restating Proposition 1:

Proposition 1 (incentive hypothesis): The likelihood of adopting either type of ESOP is positively related to the strength of employee incentives created by stock ownership.

Proposition 1 predicts a positive relationship between the proxies for marginal monitoring costs—market-to-book ratio, Tobin's Q , and research and development intensity—and the likelihood of adopting an ESOP.

Tax effects. Owner-managers will adopt ESOPs if doing so increases firm value. ESOP tax and financing benefits are one source of increased value. Because ESOP tax shields accrue primarily to leveraged plans, firms with relatively more operating income exposed to taxation should be more likely to adopt leveraged ESOPs. Firms unable to capitalize ESOP tax benefits, such as those reporting a net-operating-loss carryforward, should be less likely to adopt a leveraged ESOP (Beatty [1994]). The effects of these factors on the likelihood of adoption test Proposition 2:

Proposition 2 (tax hypothesis): The likelihood of adopting a leveraged ESOP is positively related, and the likelihood of adopting a nonleveraged ESOP unrelated, to the ability to use tax shields.

In addition, Chapter 2 demonstrates that the riskier a firm's operating environment the lower the expected value of ESOP tax shields. This implies a negative relationship between the likelihood of adopting a leveraged ESOP and risk. But risk also raises the

cost of a stock ownership plan when employees are risk-averse, implying a negative relationship between the likelihood of adopting either type of ESOP and risk. Since the latter implication applies to both types of plans, the risk variable discriminates between Proposition 3 and its alternative, 3a:

Proposition 3 (tax hypothesis): The likelihood of adopting a leveraged ESOP is negatively related, and the likelihood of adopting a nonleveraged ESOP unrelated, to risk.

Proposition 3a (incentive hypothesis): The likelihood of adopting either type of ESOP is negatively related to risk.

Subsidized ESOP loans will be more attractive to firms with higher borrowing costs (Beatty [1994]). Therefore, the debt-to-equity ratio should be positively related to the likelihood of adopting a leveraged ESOP.

Control effects. I measure corporate control effects using segmented insider ownership, takeover status, and defensive posture. Segmenting insider ownership facilitates a test of Proposition 4:

Proposition 4 (control hypothesis): The likelihood of adopting a leveraged ESOP is negatively related to insider ownership; the likelihood of adopting a nonleveraged ESOP is positively, then negatively, related to insider ownership.

In addition, ESOPs have been shown to be related to other defensive tactics (Beatty [1994], Sokobin [1993]) and to be effective defensive tools (Bhagat and Jefferies [1991], Chaplinsky and Niehaus [1994]). If defense is an important motivator, the likelihood of adopting either type of ESOP will be positively related to variables that indicate the presence of takeover threats and previous defensive maneuvers.

Miscellaneous effects. Finally, I include capital intensity (gross property, plant, and equipment per employee) and the log of firm size in all models. In capital-intense firms, supervision may be more costly and care of equipment a concern (Kruse [1996]). If so, a positive relationship between the likelihood of adopting an ESOP and capital intensity would imply an incentive motivation. The log of firm size is included to control for size-related effects.

5.3 *Multinomial logit regression results*

The results are reported in Table 6. The regressions have some explanatory power. Likelihood ratio statistics are significant at the 10% level of confidence for regressions on level data (panel *a*), the 5% level for regressions on differenced data (panel *b*), and the 5-10% level for regressions on a combination of level and differenced data. But they explain little of the variation in the likelihood of adoption. Pseudo- R^2 s are low, ranging between 0.05 and 0.08. Only three variables exhibit statistically significant effects across all the model specifications in which they appear, and then only with respect to leveraged ESOPs. The likelihood of adopting a leveraged ESOP increases with increases in Tobin's Q , with increases in insider ownership in the 10-25% ownership segment, and with the presence of defensive tactics.

Support for an employee incentive motivation is quite weak. Proposition 1, that a desire to increase employee incentives motivates the decision to adopt an ESOP, receives support from only one variable, the change in Tobin's Q . The likelihood of adopting a leveraged ESOP is positively related to the change in Q , statistically significant at the 10% level of confidence in the regressions on differenced data (panel *b*) and the 5% level in the regressions on combined data (panel *c*). The likelihood of the presence of an ESOP is unrelated to the level of Tobin's Q (panel *a*) in the regressions on level data and

negatively related (10% for leveraged ESOPs) in the regressions on combined data (panel *c*). To the extent that Tobin's Q reflects a firm's marginal monitoring costs, firms are more likely to adopt a leveraged ESOP the greater the increase in their marginal monitoring costs. This interpretation must be made with caution, however, because the relationships between the likelihood of adopting a nonleveraged ESOP and the change in Tobin's Q , and between the likelihood of adopting either type of ESOP and all other proxies for marginal monitoring costs are uniformly insignificant.

Support for a tax motivation also is weak. Proposition 2 receives no support. None of the variables (level or differenced) selected to capture tax and financing effects are important predictors of the likelihood of adopting or presence of either type of ESOP. But Proposition 3, that risk reduces the expected value of future tax shields, receives some support over its alternative. Nonsystematic risk is negatively related to the presence of a leveraged ESOP at statistically significant levels. The alternate Proposition 3a, that risk increases the cost for both types of ESOPs when employees are risk averse, is not supported. This interpretation is tempered somewhat by the negative and nearly statistically significant relationship (t-statistics from -1.50 to -1.60) between the presence of a nonleveraged ESOP and nonsystematic risk in the regressions on level data (panel *a*).

There is clear evidence of control-related effects, though not those predicted for insider ownership. I find a robust positive relationship between the likelihood of adopting a leveraged ESOP and an aggressive defensive posture, significant at the 1% level across all model specifications. This is consistent with Beatty [1994] and Sokobin [1993] and supports the view that defense is a powerful motivator of leveraged plans.

I find no evidence of the predicted negative monotonic relationship between the presence of a leveraged ESOP and insider ownership, nor of the predicted concave relationship for nonleveraged ESOPs (panel *a*). But I do find a robust positive relationship between the likelihood of adopting a leveraged ESOP and the change in insider ownership in the 10 to 25 percent ownership segment (panels *b* and *c*). Insiders appear to be increasing their levels of ownership prior to increasing that of their employees. This is consistent with owner-managers believing in the motivational effect of stock ownership, i.e., insiders are leading by example. However, the significance of an aggressive defensive posture suggests that ESOPs more likely are being used to enhance insider control.

Independent alternatives. There is also evidence that though leveraged and nonleveraged ESOPs serve different clienteles they share similar motivations. The Hausman test statistic fails to reject the null hypothesis of independent alternatives in the regressions on level data (panel *a*), but overwhelmingly rejects the null hypothesis when differenced data are used, either separately or in combination with level data (panels *b* and *c*). The factors that predict the presence of a leveraged or nonleveraged ESOP have statistically significantly different effects; the changes in those factors that predict the decision to adopt do not.

5.4 *Binary logit regression results*

To further test the sensitivity of the results to the IIA assumption, I segment the data by the type of ESOP adopted (including the respective control firms) and re-estimate the models using simple binary logit regressions. The results for these regressions on combined level and differenced data are reported in Table 7.

Only one of the previously reported statistically significant relationships changes: the relationship between the presence of a leveraged ESOP and risk disappears. In addition, several new relationships appear. First, the presence of a leveraged ESOP is now positively related to the percent of operating income exposed to taxation (at the 5% level of confidence) and debt-to-equity ratio (10%), supporting the tax incentive hypothesis (via Proposition 2).

Second, the likelihood of adopting a nonleveraged ESOP is negatively related to changes in the 10-25% insider ownership bracket (10%). In addition, the positive relationship between the likelihood of the presence of a nonleveraged ESOP and an aggressive defensive posture approaches statistical significance. These findings suggest that nonleveraged ESOPs, too, provide a vehicle through which insiders can reduce their holdings and still maintain control.

Finally, two other weak (10% level of confidence) relationships appear with respect to nonleveraged ESOP adopters. The likelihood of adoption is positively related to the change in both capital intensity (in 3 of the 4 model specifications) and debt-to-equity ratio (in all 4 model specifications). The positive relationship with the change in capital intensity is consistent with an incentive motivation for nonleveraged ESOPs. (For leveraged ESOP adopters the relationship is negative but only weakly statistically significant (10%) in 2 of the 4 model specifications.) The positive relationship to the change in debt-to-equity ratio could indicate a struggling firm in the process of restructuring its employee incentives. But it could also indicate a proactive defensive effort in which a nonleveraged ESOP is enacted in anticipation of a takeover attempt, ready for conversion to a leveraged plan should an attempt materialize.

5.5 *Summary*

The results provide only tenuous support for the incentive, tax, and control hypotheses. Support for the incentive hypothesis (via Proposition 1) derives from just one of 4 proxies chosen to capture incentive effects; support for the tax and financing hypotheses (via Propositions 2 and 3) depends upon model specification; and support for the control hypothesis (Proposition 4) is non-existent. The only consistent control-related effect is the positive relationship between the presence of an ESOP and an aggressive defensive posture.

The next chapter examines ESOP incentive effects from a different perspective, by considering the relationship between the average level of individual employee ownership created by a new ESOP and the proxies for employee incentives.

TABLE 6: Results from multinomial logit regressions on cross-sectional level (differenced) data for 48 leveraged and 25 nonleveraged ESOP adopters and 91 control firms.

Reported coefficients are maximum likelihood estimators for the likelihood function

$$L = \prod_{i=1}^n P_{it}^{y_{it}} P_{in}^{y_{in}} P_{i0}^{y_{i0}}, \text{ where } P_{ij} = \frac{\exp(x_i' \beta_j)}{1 + \sum_{j=1,n} \exp(x_i' \beta_j)}; \text{ } y_{it}=1 \text{ if firm } i \text{ adopts a leveraged ESOP, else zero; } y_{in}=1 \text{ if firm } i \text{ adopts a nonleveraged ESOP, else zero; } y_{i0}=1 \text{ if firm } i \text{ does not adopt an ESOP.}$$

Observations on the following variables are the level at year ending just prior to adoption or the change over the year ending just prior to the ESOP decision: market-to-book ratio is the ratio of market value to book value of equity; Tobin's Q is the ratio of the market value of a firm's assets to their replacement cost; research and development intensity 1 is research and development expense per employee; research and development intensity 2 is research and development expense divided by net sales; capital intensity is gross plant, property, and equipment per employee; tax ratio is the ratio of operating income less interest and amortization divided by operating income; debt-to-equity is the ratio of the book value of debt to the market value of equity; and control variables are segments of beneficial insider ownership levels. The following variables are not differenced: NOL is a binary variable equal to 1 if firm reports a net operating loss carryforward, else 0; threat is a binary variable equal to 1 when a firm is the subject or takeover threats or rumors during the two years prior to an ESOP announcement, else zero; defense is a binary variable equal to one if a firm initiates a defensive restructuring or poison pill plan during the two years prior to adoption, else zero; size is the natural log of the market value of equity; beta and root-mean-squared error are from fitting the market model; and return is the log of a firm's stock price at the end of the year prior to adoption divided by the year-end stock price a year earlier. Numbers in parentheses are *t*-statistics.

----- Panel a: Level data -----

Incentive Variables	1		2		3		4	
	Leveraged	Nonleveraged	Leveraged	Nonleveraged	Leveraged	Nonleveraged	Leveraged	Nonleveraged
Market-to-book	-0.325 (-1.07)	-0.0901 (-0.22)	-0.329 (-1.08)	-0.0909 (-0.22)				
Tobin's Q					-0.568 (-1.52)	0.104 (0.23)	-0.574 (-1.54)	0.105 (0.23)
R&D intensity 1 (R&D/employee)	-0.0395 (-0.69)	0.0244 (0.52)			-0.0417 (-0.70)	0.0238 (0.51)		
R&D intensity 2 (R&D/net sales)			-3.46 (-0.48)	2.42 (0.96)			-3.89 (-0.53)	2.43 (0.94)
Employee influence								
Capital intensity	-0.0014 (-1.51)	-0.0010 (-0.82)	-0.0014 (-1.47)	-0.0011 (-0.86)	-0.0015 (-1.55)	-0.0010 (-0.81)	-0.0014 (-1.52)	-0.0010 (-0.84)

TABLE 6, panel *a*, cont.: Results from multinomial logit regressions on level data segmented by the type of ESOP adopted.

<i>Tax Variables</i>	1		2		3		4	
	Leveraged	Nonleveraged	Leveraged	Nonleveraged	Leveraged	Nonleveraged	Leveraged	Nonleveraged
Tax ratio	0.398 (0.85)	0.0835 (0.24)	0.391 (0.84)	0.0492 (0.14)	0.437 (0.93)	0.0855 (0.25)	0.428 (0.92)	0.0514 (0.15)
Debt-to-equity	0.618 (1.51)	0.134 (0.30)	0.629 (1.53)	0.145 (0.33)	0.627 (1.54)	0.162 (0.37)	0.637 (1.56)	0.174 (0.40)
NOL	0.462 (0.65)	0.889 (1.22)	0.438 (0.62)	0.920 (1.26)	0.423 (0.60)	0.924 (1.27)	0.404 (0.57)	0.956 (1.31)
<i>Control Variables</i>								
0% < inside < 10%	0.0290 (0.34)	-0.0329 (-0.26)	0.0334 (0.40)	-0.0313 (-0.25)	0.0399 (0.47)	-0.0455 (-0.36)	0.0441 (0.52)	-0.0440 (-0.35)
10% < inside < 25%	-0.0281 (-0.58)	0.0420 (0.75)	-0.0304 (-0.63)	0.0377 (0.67)	-0.0297 (-0.61)	0.0449 (0.80)	-0.0318 (-0.66)	0.0406 (0.72)
25% < inside	0.0171 (1.00)	0.0019 (0.12)	0.0173 (1.01)	0.0015 (0.09)	0.0166 (0.99)	-0.0003 (-0.02)	0.0168 (1.00)	-0.0008 (-0.05)
Defense	1.34*** (2.88)	0.335 (0.50)	1.32*** (2.85)	0.347 (0.52)	1.31*** (2.83)	0.372 (0.56)	1.30*** (2.78)	0.381 (0.57)
Threat	-0.102 (-0.22)	-0.694 (-1.07)	-0.0996 (-0.22)	-0.686 (-1.05)	-0.115 (-0.25)	-0.695 (-1.06)	-0.113 (-0.24)	-0.687 (-1.05)

TABLE 6, panel α , cont.: Results from multinomial logit regressions on level data segmented by the type of ESOP adopted.

<i>Miscellaneous Variables</i>	1		2		3		4	
	Leveraged	Nonleveraged	Leveraged	Nonleveraged	Leveraged	Nonleveraged	Leveraged	Nonleveraged
Size	-0.0229 (-0.10)	-0.471* (-1.68)	-0.0317 (-0.14)	-0.465* (-1.66)	0.0209 (0.09)	-0.538* (-1.88)	0.0146 (0.07)	-0.531* (-1.86)
Beta	0.601 (1.19)	0.257 (0.53)	0.572 (1.14)	0.210 (0.44)	0.631 (1.24)	0.258 (0.54)	0.606 (1.19)	0.210 (0.44)
Root-mean-squared error	-64.4** (-2.40)	-29.8 (-1.52)	-64.2** (-2.39)	-29.4 (-1.50)	-64.0** (-2.37)	-31.6 (-1.60)	-63.7** (-2.35)	-31.3 (-1.58)
Constant	-0.0583 (-0.04)	1.41 (0.74)	-0.0218 (-0.01)	1.44 (0.75)	-0.0736 (-0.05)	1.61 (0.85)	-0.0457 (-0.03)	1.64 (0.86)
Likelihood ratio [degrees of freedom] { <i>p</i> -value}	40.22* [30] {0.101}		41.45* [30] {0.080}		41.93* [30] {0.073}		43.19* [30] {0.056}	
Pseudo- R^2 †	0.046		0.048		0.049		0.050	
Hausmann test statistic‡ { <i>p</i> -value}	0.47 {1.00}	1.19 {1.00}	1.19 {1.00}	1.30 {1.00}	0.10 {1.00}	1.23 {1.00}	1.22 {1.00}	1.37 {1.00}

TABLE 6, panel b: Results from multinomial logit regressions on differenced data segmented by the type of ESOP adopted. Sample includes 23 nonleveraged ESOP adopters, 48 leveraged ESOP adopters, and 83 control firms.

	<i>Panel b: Differenced data</i>							
	1		2		3		4	
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
<i>Incentive variables</i>								
Change in market-to-book ratio	0.0065 (0.02)	0.860 (1.17)	-0.0130 (-0.04)	0.817 (1.13)				
Change in Tobin's Q			1.35* (1.75)	1.05 (1.14)	1.34* (1.71)	0.989 (1.08)		
Change in R&D intensity 1 (R&D/employee)	-0.282 (-0.97)	0.145 (0.98)	-0.322 (-1.08)	0.141 (0.96)				
Change in R&D intensity 2 (R&D/net sales)			-0.302 (-0.02)	5.02 (0.70)	-4.07 (-0.13)	4.77 (0.71)		
<i>Employee influence</i>								
Change in capital intensity	-0.0017 (-0.82)	0.0059 (1.23)	-0.0017 (-0.82)	0.0056 (1.19)	-0.0016 (-0.76)	0.0059 (1.22)	-0.0015 (-0.74)	0.0056 (1.17)
<i>Tax variables</i>								
Change in tax ratio	-0.0084 (-0.07)	-0.354 (-1.41)	-0.0060 (-0.05)	-0.349 (-1.40)	0.0028 (0.02)	-0.396 (-1.50)	0.0063 (0.05)	-0.386 (-1.48)
Change in debt-to-equity	0.889 (1.27)	1.40* (1.66)	0.898 (1.29)	1.41* (1.69)	0.900 (1.28)	1.37 (1.63)	0.921 (1.32)	1.38* (1.65)
<i>Changes in control variables</i>								
0% < inside < 10%	0.0869 (0.63)	-0.0808 (-0.42)	0.0879 (0.64)	-0.0841 (-0.44)	0.0947 (0.68)	-0.0698 (-0.36)	0.0945 (0.68)	-0.0751 (-0.39)
10% < inside < 25%	0.144** (2.29)	-0.0186 (-0.23)	0.138** (2.21)	-0.0145 (-0.18)	0.136** (2.14)	-0.0180 (-0.23)	0.129** (2.06)	-0.0139 (-0.17)
25% < inside	-0.0189 (-0.51)	-0.0040 (-0.12)	-0.0165 (-0.44)	-0.0046 (-0.14)	-0.0129 (-0.36)	-0.0039 (-0.12)	-0.0103 (-0.28)	-0.0042 (-0.12)

TABLE 6, panel c: Results from multinomial logit regressions on level and differenced data segmented by the type of ESOP adopted.

	Panel c: Mixed data							
	1		2		3		4	
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
<i>Incentive variables</i>								
Market-to-book ratio	-0.262 (-0.84)	-0.160 (-0.33)	-0.293 (-0.93)	-0.144 (-0.29)				
Change in market-to-book ratio	0.158 (0.40)	0.624 (0.89)	0.136 (0.35)	0.616 (0.88)				
Tobin's Q					-0.781* (-1.87)	-0.0235 (-0.05)	-0.791* (-1.91)	-0.0083 (-0.02)
Change in Tobin's Q					2.12** (2.12)	0.665 (0.72)	2.06** (2.05)	0.635 (0.69)
R&D intensity 1 (R&D/employee)	-0.0602 (-0.76)	-0.0806 (-0.63)			-0.153 (-0.56)	-0.0809 (-0.63)		
Change in R&D intensity 1 (R&D/employee)	-0.077 (-0.22)	0.261 (0.92)			-0.322 (-1.08)	0.256 (0.91)		
R&D intensity 2 (R&D/net sales)			-7.75 (-0.88)	-3.44 (-0.29)			-6.18 (-0.68)	-3.38 (-0.28)
Change in R&D intensity 2 (R&D/net sales)			9.51 (0.45)	8.50 (0.51)			3.29 (0.10)	8.26 (0.50)
<i>Employee influence</i>								
Capital intensity	-0.0011 (-1.12)	-0.0005 (-0.32)	-0.0010 (-1.14)	-0.0004 (-0.27)	-0.0012 (-1.26)	-0.0004 (-0.24)	-0.0012 (-1.23)	-0.0003 (-0.18)
Change in capital intensity	-0.0018 (-0.83)	0.0080 (1.33)	-0.0018 (-0.79)	0.0080 (1.35)	-0.0025 (-1.07)	0.0076 (1.29)	-0.0023 (-1.02)	0.0077 (1.30)

TABLE 6, panel c, cont.: Results from multinomial logit regressions on level and differenced data segmented by the type of ESOP adopted.

	1		2		3		4	
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
<i>Tax variables</i>								
Tax ratio	-0.0230 (-0.08)	0.534 (1.16)	-0.0084 (-0.03)	0.529 (1.14)	-0.0933 (-0.32)	0.504 (1.03)	-0.0670 (-0.23)	0.504 (1.02)
Change in tax ratio	0.0034 (0.01)	-0.569 (-1.46)	-0.0087 (-0.04)	-0.580 (-1.49)	0.0930 (0.35)	-0.560 (-1.37)	0.0726 (0.28)	-0.574 (-1.40)
Debt-to-equity ratio	0.715 (1.34)	0.266 (0.44)	0.711 (1.33)	0.295 (0.48)	0.687 (0.34)	0.211 (0.37)	0.710 (1.38)	0.240 (0.42)
Change in debt-to-equity ratio	0.601 (0.84)	1.65 (1.61)	0.600 (0.85)	1.68 (1.64)	0.470 (0.65)	1.59 (1.59)	0.475 (0.66)	1.62 (1.62)
<i>Control variables</i>								
0% < inside < 10%	0.0233 (0.23)	-0.0163 (-0.10)	0.0356 (0.35)	-0.0117 (-0.07)	0.0611 (0.58)	-0.0339 (-0.21)	0.0730 (0.70)	-0.0285 (-0.18)
Change in 0% < 10% segment	0.0649 (0.43)	-0.101 (-0.45)	0.0635 (0.43)	-0.104 (-0.46)	0.0600 (0.39)	-0.0982 (-0.44)	0.0587 (0.38)	-0.101 (-0.44)
10% < inside < 25%	-0.106 (-1.56)	0.0586 (0.77)	-0.117* (-1.74)	0.0592 (0.78)	-0.110 (-1.60)	0.0659 (0.86)	-0.122* (-1.81)	0.0659 (0.87)
Change in 10% < 25% segment	0.198*** (2.64)	-0.0522 (-0.56)	0.199*** (2.65)	-0.0526 (-0.56)	0.200** (2.54)	-0.0467 (-0.51)	0.201** (2.56)	-0.0471 (-0.51)
25% < inside	0.0371* (1.71)	-0.0032 (-0.16)	0.0394* (1.79)	-0.0036 (-0.18)	0.0380* (1.80)	-0.0083 (-0.43)	0.0399* (1.88)	-0.0085 (-0.44)
Change in 25% < inside segment	-0.0347 (-0.81)	0.0033 (0.09)	-0.0363 (-0.84)	0.0036 (0.09)	-0.0275 (-0.62)	0.0062 (0.16)	-0.0290 (-0.66)	0.0062 (0.16)
Defense	1.41*** (2.74)	0.185 (0.25)	1.39*** (2.71)	0.177 (0.24)	1.43*** (2.72)	0.214 (0.28)	1.40*** (2.68)	0.202 (0.27)
Threat	-0.392 (-0.78)	-0.187 (-0.27)	-0.392 (-0.78)	-0.177 (-0.25)	-0.470 (-0.90)	-0.183 (-0.26)	-0.457 (-0.87)	-0.171 (-0.24)

TABLE 6, panel c, cont.: Results from multinomial logit regressions on level and differenced data segmented by the type of ESOP adopted.

Other variables	1		2		3		4	
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
Size	-0.0349 (-0.14)	-0.319 (-1.03)	-0.0624 (-0.25)	-0.330 (-1.06)	0.0749 (0.28)	-0.369 (-1.18)	0.0312 (0.12)	-0.381 (-1.21)
Beta	1.01* (1.69)	-0.232 (-0.34)	1.07* (1.73)	-0.336 (-0.48)	1.09* (1.80)	-0.180 (-0.26)	1.12* (1.74)	-0.288 (-0.41)
Root-mean-squared error	-71.2* (-1.97)	-3.87 (-0.18)	-74.1** (-2.04)	-3.45 (-0.16)	-73.4* (-1.90)	3.84 (0.18)	-77.0* (-1.96)	-3.49 (-0.16)
Return	-0.441 (-0.53)	0.864 (0.75)	-0.349 (-0.44)	0.942 (0.83)	-1.52 (-1.60)	0.898 (0.76)	-1.37 (-1.50)	0.998 (0.85)
Constant	0.195 (0.10)	0.0914 (0.04)	0.343 (0.18)	0.100 (0.05)	0.0367 (0.02)	0.277 (0.13)	0.283 (0.14)	0.287 (0.13)
Likelihood ratio [degrees of freedom] {p-value}	58.4* [46] {0.104}		58.1 [46] {0.109}		64.0** [46] {0.041}		63.4** [46] {0.045}	
Pseudo- R^2 †	0.076		0.075		0.084		0.083	
Hausman test statistic‡ {p-value}	1694.9*** {0.00}	306.1*** {0.00}	533.9*** {0.00}	2188.9** {0.00}	344.3*** {0.00}	266.4*** {0.00}	1.75 {1.00}	418.3*** {0.00}

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

† Pseudo- $R^2 = \frac{L_{\Omega}^{2/n} - L_{\omega}^{2/n}}{1 - L_{\omega}^{2/n}}$, where L_{Ω} and L_{ω} denote the maximum values of the restricted and unrestricted likelihood functions (Maddala [1983]).

‡ $T = (\theta_A - \theta_C)' [\text{cov}(\theta_A) - \text{cov}(\theta_C)]' (\theta_A - \theta_C)$ where θ_A and θ_C are the estimated parameters from the reduced and full models respectively, and $\text{cov}(\theta_A)$ and $\text{cov}(\theta_C)$ are their respective covariance matrices, and t is the generalized inverse operator. T is distributed χ^2 with degrees of freedom equal to the rank of the generalized inverse of $[\text{cov}(\theta_A) - \text{cov}(\theta_C)]$ (Hausman and McFadden [1984]).

TABLE 7: Results from binomial logit regressions on differenced and level data segmented by the type of ESOP adopted.

Samples include 23 nonleveraged ESOP adopters paired with 23 control firms, and 48 leveraged ESOP adopters paired with 49 control firms. Control firms are matched by Compustat SIC code and net sales. Observations on the following variables are of levels at year ending just prior to adoption or changes over the year ending just prior to the ESOP decision: market-to-book ratio is the ratio of market value to book value of equity; Tobin's Q is the ratio of the market value of a firm's assets to their replacement cost; research and development intensity 1 is research and development expense per employee; research and development intensity 2 is research and development expense divided by net sales; capital intensity is gross plant, property, and equipment per employee; tax ratio is the ratio of operating income less interest and amortization divided by operating income; debt-to-equity is the ratio of the book value of debt to the market value of equity, and control variables are segments of beneficial insider ownership levels. The following variables are not differenced: threat is a binary variable equal to 1 when a firm is the subject or takeover threats or rumors during the two years prior to an ESOP announcement, else zero; defense is a binary variable equal to 1 when a firm initiates a defensive restructuring or poison pill plan during the two years prior to adoption, else zero; size is the natural log of the market value of equity; beta and root-mean-squared error are from fitting the market model; and return is the log of a firm's stock price at the end of the year prior to adoption divided by the year-end stock price a year earlier. Numbers in parentheses are t -statistics.

	1	2	3	4	5	6	7	8
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
<i>Incentive variables</i>								
Market-to-book ratio	-0.380 (-1.08)	-2.93 (-1.26)	-0.394 (-1.14)	-2.69 (-1.40)				
Change in market-to-book ratio	0.358 (0.74)	4.24 (1.35)	0.392 (0.82)	3.86 (1.37)				
Tobin's Q					-1.09** (-2.13)	-2.27 (-1.39)	-1.06** (-2.13)	-2.16 (-1.38)
Change in Tobin's Q					3.79** (2.43)	3.03 (1.23)	3.69** (2.40)	2.92 (1.31)

TABLE 7, cont.: Results from binomial logit regressions on differenced and level data segmented by the type of ESOP adopted.

	1	2	3	4	5	6	7	8
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
<i>Incentive variables, cont.</i>								
R&D intensity 1 (R&D/employee)	0.0518 (0.52)	-0.723 (-1.27)			0.078 (0.75)	-0.619 (-1.28)		
Change in R&D intensity 1 (R&D/employee)	-0.740 (-1.19)	1.29 (1.12)			-0.979 (-1.44)	1.09 (1.21)		
R&D intensity 2 (R&D/net sales)			-1.31 (-0.13)	-35.7 (-0.80)			2.62 (0.24)	-30.2 (-0.70)
Change in R&D intensity 2 (R&D/net sales)			-12.3 (-0.29)	140.2 (0.65)			-30.9 (-0.69)	79.1 (0.54)
<i>Employee influence</i>								
Capital intensity	-0.0001 (-0.12)	-0.0435* (-1.69)	-0.0002 (-0.19)	-0.0338 (-1.58)	-0.0002 (-0.16)	-0.0343 (-1.65)	-0.0002 (-0.15)	-0.0254 (-1.64)
Change in capital intensity	-0.0046 (-1.53)	0.512* (1.74)	-0.0043 (-1.44)	0.404 (1.62)	-0.0063* (-1.81)	0.404* (1.71)	-0.0058* (-1.73)	0.307* (1.76)
<i>Tax variables</i>								
Tax ratio	2.23** (2.40)	-7.94 (-1.26)	2.22** (2.35)	-7.04 (-1.10)	2.52** (2.35)	-6.22 (-1.24)	2.47** (2.34)	-4.94 (-1.08)
Change in tax ratio	0.169 (0.49)	3.52 (1.27)	0.120 (0.35)	2.72 (1.01)	0.296 (0.69)	2.39 (1.03)	0.222 (0.53)	1.61 (0.77)
Debt-to-equity ratio	1.29* (1.67)	0.889 (0.39)	1.34* (1.76)	0.476 (0.22)	1.19* (1.68)	0.911 (0.47)	1.31* (1.84)	0.906 (0.44)
Change in debt-to-equity ratio	-0.0465 (-0.04)	21.3* (1.75)	0.0521 (0.05)	21.6* (1.79)	0.235 (0.21)	18.8* (1.79)	0.272 (0.25)	18.5* (1.83)

TABLE 7, cont.: Results from binomial logit regressions on differenced and level data segmented by the type of ESOP adopted.

	1	2	3	4	5	6	7	8
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
<i>Control variables</i>								
0% < inside < 10%	-0.0328 (-0.29)	-1.88 (-1.32)	-0.0100 (-0.09)	-1.33 (-1.25)	-0.0169 (-0.15)	-1.64 (-1.27)	0.0123 (0.11)	-1.12 (-1.17)
Change in 0% < inside < 10% segment	0.112 (0.62)	2.39 (1.49)	0.0946 (0.55)	2.40 (1.40)	0.125 (0.64)	2.10 (1.61)	0.0986 (0.53)	1.93 (1.53)
10% < inside < 25%	-0.0983 (-1.18)	0.246 (0.67)	-0.123 (-1.50)	0.166 (0.55)	-0.0974 (-1.14)	0.239 (0.77)	-0.126 (-1.50)	0.200 (0.77)
Change in 10% < inside < 25% segment	0.226** (2.30)	-1.05* (-1.80)	0.238** (2.34)	-1.11* (-1.77)	0.241** (2.18)	-0.957* (-1.96)	0.259** (2.31)	-0.948* (-1.95)
25% < inside	0.0551* (1.82)	0.0473 (0.83)	0.0594* (1.94)	0.0413 (0.78)	0.0494* (1.72)	0.0303 (0.66)	0.0500* (1.75)	0.0266 (0.59)
Change in 25% < inside segment	0.0493 (0.52)	-0.0324 (-0.39)	0.0594 (0.58)	-0.0498 (-0.54)	0.0563 (0.55)	-0.0362 (-0.46)	0.0558 (0.54)	-0.0436 (-0.51)
Defense	1.41** (2.22)	3.29 (1.57)	1.38** (2.17)	3.68* (1.77)	1.79** (2.48)	3.03 (1.56)	1.67** (2.40)	3.52* (1.72)
Threat	-0.456 (-0.76)	-3.16 (-1.14)	-0.440 (-0.73)	-2.16 (-1.06)	-0.579 (-0.88)	-2.27 (-0.99)	-0.507 (-0.78)	-1.56 (-0.87)

TABLE 7, cont.: Results from binomial logit regressions on differenced and level data segmented by the type of ESOP adopted.

<i>Other variables</i>	1		2		3		4		5		6		7		8	
	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged	Leveraged	Non-leveraged
Size	-0.324 (-1.11)	-1.39 (-0.99)	-0.378 (-1.31)	-1.14 (-0.91)	-0.346 (-1.07)	-1.44 (-1.19)	-0.416 (-1.32)	-1.10 (-1.05)								
Beta	0.831 (1.21)	6.10* (1.70)	0.810 (1.08)	4.73 (1.45)	1.20 (1.57)	5.16* (1.76)	0.988 (1.26)	3.79 (1.43)								
Root-mean-squared error	-72.3 (-1.52)	-105.4 (-1.44)	-79.0 (-1.61)	-88.8 (-1.24)	-92.0* (-1.70)	-79.4 (-1.37)	-96.3* (-1.77)	-64.9 (-1.18)								
Return	-0.915 (-0.94)	-0.388 (-0.07)	-0.578 (-0.64)	-0.172 (-0.04)	-2.67** (-2.08)	0.968 (0.22)	-2.07* (-1.78)	0.781 (0.20)								
Constant	1.30 (0.58)	29.0 (1.57)	1.74 (0.78)	23.1 (1.33)	2.04 (0.85)	24.9 (1.57)	2.60 (1.07)	18.2 (1.44)								
Likelihood ratio [degrees of freedom] {p-value}	29.6 [23] {0.16}	33.9* [23] {0.067}	28.0 [23] {0.216}	32.0* [23] {0.101}	38.0** [23] {0.026}	32.6* [23] {0.088}	36.1** [23] {0.041}	30.7 [23] {0.129}								
Pseudo- R^2 †	0.119	0.363	0.112	0.335	0.160	0.344	0.150	0.317								

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

† Pseudo- $R^2 = \frac{L_{\Omega}^{2/n} - L_{\omega}^{2/n}}{1 - L_{\omega}^{2/n}}$, where L_{Ω} and L_{ω} denote the maximum values of the restricted and unrestricted likelihood functions (Maddala [1983]).

Chapter 6

6 Cross-sectional regressions on average employee ownership

6.1 Factors affecting average employee ownership

This chapter tests the implications that firms will increase individual employee ownership more the larger their marginal monitoring costs and the smaller their size (short- and long-term comparative statics from Chapter 3, *CS.5* and *CS.6* and *CS.8* and *CS.9*, respectively). ESOPs are well-suited to test these implications because management simultaneously determines the size of the ESOP to be adopted and the average increase in individual employee stock ownership. I use the average increase in individual employee ownership engendered by the ESOP decision (the size of the ESOP as a percentage of outstanding equity after the adoption divided by the total number of employees) to proxy for the increase in individual employee ownership. Because marginal monitoring costs are not directly observable, the tests are for the joint hypotheses that the selected variables are good proxies for marginal monitoring costs and that marginal monitoring costs have the predicted effect.

I estimate the model

$$\alpha_{emp_i} = \beta_0 + \sum_{j=1}^k \beta_j \tilde{X}_{ij} + d_i \left(\gamma_0 + \sum_{j=1}^k \gamma_j \tilde{X}_{ij} \right) + \tilde{e}_i, \quad (37)$$

where the dependent variable is the increase in average individual employee stock ownership due to the adoption or expansion of an ESOP by firm i ; d_i is a binary variable equal to 1 if firm i adopts a nonleveraged ESOP, else zero; the independent variables that proxy for marginal monitoring costs are the ratio of a firm's market value to book value of equity, Tobin's Q , and research and development intensity; the independent variable to

control for employee productivity is capital intensity; and the independent variable used to measure the marginal effect of firm size is the log of the market value of a firm's equity. The estimated parameters $\hat{\gamma}_0, \hat{\gamma}_1, \dots, \hat{\gamma}_k$ measure the difference between nonleveraged and leveraged ESOP effects for the intercept and factors $j = 1, \dots, k$. The net marginal effect of factor j on the size of the increase in employee ownership created by a nonleveraged ESOP is the sum of the two coefficients, $\hat{\beta}_j + \hat{\gamma}_j$.

Two econometric problems are present: heteroscedasticity and multicollinearity. Research and development intensity, capital intensity, and the increase in employee ownership are functions of the scale of a firm, raising the likelihood of heteroscedastic error terms. In simulations using Compustat data, Barth and Kallapur [1996] find that the White χ^2 test for heteroscedasticity fails to detect even obvious cases when samples contain fewer than 100 observations and that White standard errors are well specified in the absence of heteroscedasticity. They recommend including a scale proxy as an independent variable and reporting t -statistics based on White standard errors. I adopt their method.

The variables market-to-book ratio and Tobin's Q are highly collinear (Pearson coefficient of 0.87, significant at the 1% level). To ameliorate the problems associated with multicollinearity, I estimate models that include either market-to-book ratio or Tobin's Q .

The results are reported in Table 8.³⁴ Unlike the multinomial logit regressions in the previous chapter, these regressions have considerable explanatory power (F -statistics greater than 9.0 and adjusted- R^2 s greater than 0.54). As predicted, I find positive

³⁴To check the sensitivity of the results to the inclusion of an independent deflator variable, I also estimate the regressions without the independent deflator. The results are qualitatively unchanged. I report them for one model in Appendix 5, Table A.

relationships between the average increase in employee ownership and my proxies for marginal monitoring costs for both leveraged and nonleveraged ESOP adopters. For the leveraged ESOP segment, the relationships are statistically significant for market-to-book ratio and research and development expense per employee, and nearly significant for Tobin's Q and research and development expense per net sales. For nonleveraged ESOP adopters, the net effects of both specifications for research and development intensity are positive at statistically significant levels, but market-to-book and Tobin's Q have no net marginal effect. Also as predicted, I find a negative relationship between the average increase in employee ownership and firm size, but only for the leveraged ESOP segment.

I also find a positive relationship between the increase in average employee ownership and my proxy for employee productivity (capital intensity) in the leveraged ESOP segment. This is consistent with the notion that capital leverages an ESOP's incentive effect.

6.2 *Differences between leveraged and nonleveraged ESOP adopters*

This section considers the significance of the differences between leveraged and nonleveraged adopters. I calculate F -statistics to test two null hypotheses: 1) all nonleveraged coefficients equal zero; and 2) all nonleveraged coefficients for marginal monitoring cost proxy variables equal zero. Rejection of the first null hypothesis indicates that general differences exist between leveraged and nonleveraged adopters, that is, they serve different clienteles. Rejection of the second indicates that the marginal monitoring cost proxies have different marginal effects on the increase in employee ownership, hence employee incentives, for leveraged and nonleveraged adopters.

These F -statistics are reported at the bottom of Table 8. The first null hypothesis is rejected in every case; the second never is. The difference between leveraged and

nonleveraged adopters appears to derive more from the effects of firm size and those captured by the regression intercept than from marginal monitoring costs.

6.3 *Summary*

The results are consistent with the implications being tested. Average employee ownership is positively related to at least one proxy for marginal monitoring costs in every model specification. And the increase in average employee ownership is smaller the larger the firm for the leveraged ESOP segment. But this support is weakened by the absence of statistically significant relationships between the increase in employee ownership and Tobin's Q (for both leveraged and nonleveraged segments), research and development expense per employee (for the leveraged segment), and market-to-book ratio (for the nonleveraged segment).

The next chapter tests the implications relating an ESOP's economic value to monitoring costs.

TABLE 8: Results from regressing the average increase in fractional employee ownership created by a new or significant addition to an existing ESOP on a cross-section of firm characteristics.

Results of cross-sectional regressions^a using data from 73 firms (48 leveraged and 25 nonleveraged ESOP adopters). The dependent variable is the average increase in individual employee ownership resulting from the ESOP. The independent variables are defined as follows: market-to-book ratio is the ratio of market value to book value of equity; Tobin's Q is the ratio of the market value of a firm's assets to their replacement cost; research and development intensity 1 is research and development expense per employee; research and development intensity 2 is research and development expense divided by net sales; capital intensity is gross plant, property, and equipment per employee; size is the natural log of the market value of equity. Regressions use net sales as an independent deflator variable and t -statistics are calculated using White standard deviations, as recommended by Barth and Kallapur [1996]. All observations are for the year ending just prior to the year in which an ESOP decision is announced.

<i>Variables</i>	1		2		3		4	
	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance
<i>Employee incentives</i>								
Market-to-book ratio	2.34*** (3.40)	-2.24** (-2.55)	2.30*** (3.34)	-2.40*** (-2.80)				
Tobin's Q					2.29 (1.52)	-2.55 (-1.47)	2.25 (1.49)	-2.73 (-1.62)
R and D Intensity 1	0.265** (2.68)	-0.0274†† (-0.27)			0.226** (2.27)	0.0128†† (0.12)		
R and D Intensity 2			24.7 (1.45)	-17.0†† (-1.00)			20.2 (1.17)	-12.4†† (-0.72)
<i>Employee influence</i>								
Capital Intensity	0.0124*** (16.4)	-0.0114*** (-6.13)	0.0123*** (14.8)	-0.0123*** (-6.79)	0.0120*** (15.8)	-0.0116*** (-5.48)	0.0119*** (14.4)	-0.0124*** (-6.11)

TABLE 8, cont.: Results from regressing the average increase in fractional employee ownership created by a new or significant addition to an existing ESOP on a cross-section of firm characteristics.

	1	2	3	4
	Leveraged	Leveraged	Leveraged	Leveraged
	Nonleveraged	Nonleveraged	Nonleveraged	Nonleveraged
	variance		variance	
<i>Variables, cont.</i>				
<i>Miscellaneous</i>				
Size	-3.93*** (-4.98)	-3.82*** (-4.91)	-3.79*** (-4.44)	-3.69*** (-4.37)
	2.84*** (3.63)	2.86*** (3.72)	2.80*** (3.30)	2.83*** (3.31)
Constant	20.1*** (4.22)	19.7*** (4.07)	19.5*** (4.08)	19.1*** (3.96)
	-15.0*** (-3.14)	-14.7*** (-3.04)	-14.3*** (-2.97)	-14.0*** (-2.88)
<i>Independent deflator</i>				
Net Sales	0.0012*** (3.47)	0.0012*** (3.36)	0.0011*** (2.83)	0.0011*** (2.75)
<i>F-statistics</i>				
Regression	10.20***	10.46***	9.44***	9.44***
[p-value]	[0.00]	[0.00]	[0.00]	[0.00]
All	7.15***	7.29***	6.77***	6.90***
nonleveraged				
coefficients	0.90	1.24	0.62	0.83
All				
nonleveraged				
incentive				
coefficients				
Adjusted-R ²	0.57	0.57	0.54	0.54

The equation estimated is: $\alpha_{emp_i} = \beta_0 + \sum_{j=1}^k \beta_j \tilde{X}_{ij} + d_i \left[\gamma_0 + \sum_{j=1}^k \gamma_j \tilde{X}_{ij} \right] + \tilde{e}_i$, where d_i is an indicator variable equal to 1 if the ESOP is

nonleveraged, else zero, and the independent variables are as defined above.

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

††, † Net effect of nonleveraged coefficient ($\beta_j - \gamma_j$) significant at the 0.05 or 0.10 level of confidence, respectively

Chapter 7

7 *ESOP wealth effects*

This chapter uses investor reaction to ESOP announcements to test two implications of the theory developed in Chapter 3 and two of the propositions developed in Chapter 2. I test the implications that firm value increases with average employee ownership and marginal monitoring costs (comparative statics *CS.11* and *CS.12*). Simultaneously, I test the propositions that leveraged and nonleveraged ESOPs have the same employee incentive but different tax and financing effects on firm value (Propositions 5 and 6).

I perform an event study, then regress the resulting cumulative abnormal daily stock price returns on a cross-section of individual firm attributes. Using abnormal returns in this manner raises several econometric concerns. The event may be partially anticipated. Also, the market's reaction likely derives from other sources besides any expected reduction in shirking, including ESOP tax, financing, and corporate control benefits and the type of ESOP adopted. I therefore estimate abnormal returns using a model that accounts for partial anticipation of the event by investors and include variables in the cross-sectional regressions to capture tax, financing, and control effects. Finally, I estimate two sets of regressions. The first set ignores differences between leveraged and nonleveraged adopters; the second explicitly controls for effects by ESOP type.

This chapter proceeds as follows. Section 7.1 describes the event study methods used. Section 7.2 reports the event study results. Section 7.3.1 reports results from the regressions on pooled data. Section 7.3.2 reports results from the regressions on data segmented by ESOP type.

7.1 Event study methods

7.1.1 Event study with partial anticipation

ESOPs provide tax, financing, and defensive benefits in addition to employee incentives. Observable firm attributes exist that identify firms able to capitalize on these benefits. Firms with larger tax exposure or subject to takeover threats will be expected to adopt or increase the size of an ESOP. Nor are firms restricted to one ESOP. Therefore ESOPs typically will be anticipated and the price reaction to ESOP announcements attenuated. I adapt Malatesta and Thompson's [1985, 1993] event study method for partially anticipated events to address this problem.

Assume a stationary economy where assets are priced by the Black zero-beta CAPM. Then

$$\tilde{R}_{i,t} = R_{0,t}(1 - \beta_i) + \beta_i \tilde{R}_{m,t} + \tilde{\psi}_{i,t} \quad (28)$$

where

- $\tilde{R}_{i,t}$ = the return on firm i 's stock during period t ,
- $\tilde{R}_{m,t}$ = the return on the market or index portfolio during period t ,
- $\tilde{R}_{0,t}$ = the return on the zero beta asset in period t ,
- $\tilde{\psi}_{i,t}$ = the abnormal component of return on firm i 's stock in period t , and
- β_i = the systematic risk of firm i 's stock.

Further assume

- i) Firm i announces its decision to adopt a leveraged or nonleveraged ESOP during any given period t .

- ii) Each firm adopts leveraged ESOPs with constant expected frequency $q_{l,i}$ and nonleveraged ESOPs with constant expected frequency $q_{n,i}$, where $q_{l,i} + q_{n,i} \leq 1$.
- iii) The incremental values as a percentage of equity realized by firm i from adopting a leveraged or nonleveraged ESOP are $w_{l,i}$ and $w_{n,i}$ respectively, where $w_{l,i}$ and $w_{n,i}$ are functions of the incentive, tax, and control benefits realized by adopting an ESOP.

At the beginning of period t the expected payoff from adopting an ESOP is the sum of the expected payoffs from adopting a leveraged ESOP and a nonleveraged ESOP. Then when an ESOP is not announced (NE_{ln}) the payoff is $-(q_{l,i}w_{l,i} + q_{n,i}w_{n,i})$. When a leveraged ESOP is announced (E_l), the unanticipated component of the payoff is the unanticipated value of the leveraged ESOP less the anticipated component of the nonleveraged ESOP, $(1 - q_{l,i})w_{l,i} - q_{n,i}w_{n,i}$. Likewise, the unanticipated component of the payoff from announcing the adoption of a nonleveraged ESOP (E_n) is $(1 - q_{n,i})w_{n,i} - q_{l,i}w_{l,i}$. If the market is efficient,

$$E(\psi_{i,t}|E_l) = (1 - q_{l,i})w_{l,i} - q_{n,i}w_{n,i} \quad (29)$$

$$E(\psi_{i,t}|E_n) = (1 - q_{n,i})w_{n,i} - q_{l,i}w_{l,i} \quad (30)$$

$$E(\psi_{i,t}|NE_{ln}) = -(q_{l,i}w_{l,i} + q_{n,i}w_{n,i}) \quad (31)$$

The abnormal return $\psi_{i,t}$ can be decomposed and Equation (28) rewritten as

$$R_{i,t} = \alpha_i + R_{0,t}(1 - \beta_i) + \beta_i R_{m,t} + \gamma_{l,i}\delta_{l,i,t} + \gamma_{n,i}\delta_{n,i,t} + u_{i,t} \quad (32)$$

where

α_i = the expected abnormal return to firm i 's stock during periods when no adoption announcement occurs,

$\gamma_{l,i}$ = the difference between the expected abnormal stock returns to firm i during periods when a leveraged ESOP is announced and periods when no ESOP is announced,

$\delta_{l,i,t}$ = a binary variable equal to 1 if firm i announces the adoption of a leveraged ESOP in period t , 0 otherwise,

$\gamma_{n,i}$ = the difference between the expected abnormal stock returns to firm i during periods when a nonleveraged ESOP is announced and periods when no ESOP is announced,

$\delta_{n,i,t}$ = a binary variable equal to 1 if firm i announces the adoption of a nonleveraged ESOP in period t , 0 otherwise,

$u_{i,t}$ = mean zero independent error term.

The parameters of the return process may be interpreted as follows. The conditioning variables $\delta_{l,i,t}$ and $\delta_{n,i,t}$ partition the series, ex post, into subseries: periods when no ESOPs, leveraged ESOPs, or nonleveraged ESOPs are announced. The coefficients α_i , $\gamma_{l,i}$, and $\gamma_{n,i}$ are therefore simple functions of expected abnormal returns, conditional on announcement related events occurring. Market efficiency requires that

$$\alpha_i = E(\psi_{i,t} | NE_{ln}) = -(q_{l,i}w_{l,i} + q_{n,i}w_{n,i}) \quad (33)$$

$$\gamma_{l,i} = E(\psi_{i,t} | E_l) - E(\psi_{i,t} | NE_{ln}) = w_{l,i} \quad (34)$$

$$\gamma_{n,i} = E(\psi_{i,t} | E_n) - E(\psi_{i,t} | NE_{ln}) = w_{n,i} \quad (35)$$

Equations (34) and (35) identify the net economic values of the ESOPs, $w_{l,i}$ and $w_{n,i}$, but not the probabilities of adopting, $q_{n,i}$ and $q_{l,i}$. The values $\gamma_{l,i}$ and $\gamma_{n,i}$ ($w_{l,i}$ and $w_{n,i}$) can be used as dependent variables in the cross-sectional regressions

$$\gamma_{l,i} = \beta'_l \mathbf{x}_i + \epsilon_i \quad (36)$$

$$\gamma_{n,i} = \beta'_n \mathbf{x}_i + \epsilon \quad (37)$$

The coefficients β'_l and β'_n test hypotheses regarding factors affecting the market's estimates of the incremental value added to a firm when it adopts an ESOP.

I estimate abnormal daily stock price returns for each firm using the model

$$\tilde{R}_{i,t} = [\alpha_i + (1 - \beta_i)R_{0,t}] + \beta_{m,i} \tilde{R}_{m,t} + \sum_{t=-20}^{+10} \gamma_{i,t} \delta_{i,t} + \tilde{u}_{i,t} \quad (38)$$

where $\delta_{i,t}$ indicates a day in the event window for either a leveraged or nonleveraged ESOP. Substituting a_i for $[-(q_{l,i}w_{l,i} + q_{n,i}w_{n,i}) + (1 - \beta_i)R_{0,t}]$ yields

$$\tilde{R}_{i,t} = a_i + b_i \tilde{R}_{m,t} + \sum_{t=-20}^{+10} \gamma_{i,t} \delta_{i,t} + \tilde{u}_{i,t} \quad (39)$$

Equation (39) is simply the market model modified to account for partially anticipated events.³⁵

7.1.2 Size and industry clustering

The firms in my sample are smaller in size relative to the decile rankings in the CRSP database. Table 9 reports firm capitalization by 2-digit SIC code. Of the 87 cases, 42 fall within the smallest 4 deciles and 32 fall within the largest 4 deciles, rather than the

³⁵Because this substitution does not restrict $R_{0,t}$ to be the same for all assets, it introduces some bias. But there is no reason to expect that the bias will, on average, differ systematically from zero. Further, Brown and Warner [1980, 1985] find evidence that more complicated event study methods do not convey any benefit over the simple one factor market model.

expected incidence of 35 in each 4-decile group. Because the distribution of the size of the firms in my sample does not reflect that of the firms in my market proxies, the CRSP equal- and value-weighted indices, the abnormal returns generated by the market model will be biased (Dimson and Marsh [1986], Kothari and Wasley [1989]).

I address this potential bias in three ways. First, I estimate abnormal returns alternately using the CRSP value-weighted and equal-weighted index for the market proxy. Second, to capture any size effect, I add a second factor to the market model—the difference between the returns on CRSP's NASDAQ and S&P 500 daily indices. Third, I estimate abnormal returns as the excess return over size-matched portfolios as suggested by Dimson and Marsh and confirmed by Kothari and Wasley. The three methods are summarized below.

$$\begin{aligned}
 \tilde{R}_{i,t} &= a_i + b_i \tilde{R}_{m,t} + \sum_{t=-20}^{+10} \gamma_{i,t} \delta_{i,t} + \tilde{u}_{i,t} & (40) \\
 \tilde{R}_{i,t} &= a_i + b_{m,i} \tilde{R}_{m,t} + b_{s,i} (\tilde{R}_{NAS,t} - \tilde{R}_{SP,t}) + \sum_{t=-20}^{+10} \gamma_{i,t} \delta_{i,t} + \tilde{u}_{i,t} \\
 \tilde{AR}_{i,t} &= \tilde{R}_{i,t} - \tilde{R}_{s_i,t},
 \end{aligned}$$

where $\tilde{R}_{m,t}$ equals the daily returns on either the CRSP value- or equal-weighted portfolio, $\tilde{R}_{NAS,t}$ equals the daily returns on the CRSP NASDAQ index, and $\tilde{R}_{SP,t}$ equals the daily returns on the CRSP S&P500 index. $\tilde{AR}_{i,t}$, firm i 's daily abnormal return, is the firm's daily return on day t less the return on an equally-weighted portfolio of firms of the same size (market capitalization) decile rank, $\tilde{R}_{s_i,t}$. All returns are continuously compounded. For the two market models, the estimation period extends from 240 days before through 59 days after the announcement. Because I account for

partial anticipation of the event, the estimation period includes the event window that runs from 20 days before through 10 days after the announcement.

7.2 *Event study results*

7.2.1 *Abnormal daily stock price returns*

Average abnormal daily stock price returns are reported in Table 10. The five estimation methods yield quite similar results. Event day average abnormal returns range between 0.50% and 0.56%. They are statistically significant when estimated by the one- or two-factor market models but not when estimated as excess returns over size-matched portfolios. All methods find an anomalous statistically significant abnormal return of approximately 0.77% thirteen trading days prior to the event day.

There is evidence of a significant size effect. The average coefficient on the size factor is significant at the 1% level in both two-factor models. It is large and positive when the CRSP value-weighted index is used as the market proxy, small and negative when the CRSP equal-weighted index is used. The stocks in my sample express more volatility than the value-weighted index and somewhat less volatility than the equal-weighted index can capture alone. The estimated abnormal returns are quite similar for both two-factor models, suggesting that, at least with respect to my sample, the inclusion of a size factor mitigates the problems associated with choosing a market proxy. Further, there is little difference between average daily abnormal stock price returns estimated with and without the size factor, especially when the average abnormal return is statistically significant. However, including a size factor increases the average adjusted- R^2 s of the regressions.

The source used to identify the event day is an important factor in estimated event day abnormal returns. Three-day cumulative abnormal returns are over 2 percentage points greater when the event day is identified through a press release rather than an SEC document filing date (1.66% v. -0.8%). The difference is significant at the 5% level of

confidence. One explanation for this difference is that SEC document filing dates do not identify the day the information becomes public as precisely as a press release. Failure to precisely identify the timing of an event greatly reduces the likelihood of detecting any abnormal performance (Brown and Warner [1980]). The difference between the two-day cumulative abnormal returns for the same segments is smaller and not statistically significant.

7.2.2 Cumulative abnormal stock price returns

I cumulate daily average abnormal returns over 6 different event windows and report them in Table 11. Two day (three day) cumulative abnormal returns range between 0.68% and 0.80% (0.69% and 0.82%), significant at the 5% (5 to 10%) level when estimated by the 1- or 2-factor market models. This is consistent with Chang and Mayers [1992], Dhillon and Ramirez [1994], and Beatty [1995]. For abnormal returns estimated by the excess returns method, only the 3.16% cumulative abnormal return realized over the entire 31 day event window is statistically significant.

7.2.3 Cumulative abnormal returns by sample segment

I next examine the importance of the type of ESOP adopted and the takeover status and defensive posture of adopting firms to investors. I segment the sample by 1) the type of ESOP adopted; 2) the presence of takeover threats or rumors during the two years prior to adoption (threatened v. non-threatened); and 3) the initiation of other defensive action during the two years prior to adoption (defensive v. non-defensive). The 2- and 3-day average cumulative abnormal returns for these sample segments are reported in Table 12, panels *a* and *b* respectively.

Investors appear to take little notice of the type of ESOP adopted. There is virtually no difference between the 2-day cumulative abnormal returns (panel *a*) for leveraged and nonleveraged ESOP adopters, 0.62% versus 0.66% respectively (0.59% versus 0.73% when estimated as excess returns). But investors are concerned with the effect of ESOPs on corporate control. Threatened and defensive firms experience statistically significant positive abnormal returns of 2.08% (2.09%) and 1.62% (1.58%) respectively. While considerably greater than the 0.26% (0.22%) and 0.24% (0.23%) returns experienced by firms in the non-threatened and non-defensive segments, the differences are not statistically significant. The magnitude and sign of the 2-day cumulative abnormal return for the threatened segment are consistent with Dhillon and Ramirez [1994], but not with Gordon and Pound [1990], Chang [1990] and Chang and Mayers [1992] who find statistically significant negative abnormal stock price returns when ESOPs are announced by threatened firms.

Several reasons could account for this discrepancy. First, each of the cited studies uses a different criteria to categorize threatened versus non-threatened firms. Dhillon and Ramirez classify as threatened firms that are under immediate takeover pressure, experience an increase in holdings by an outside party, or that are the subject of takeover rumors. These are similar to the criteria that I use. Chang separates firms according to whether the sponsoring firm is under immediate threat (defensive) or only the subject takeover rumors (anticipatory). Chang and Mayers classify as threatened firms that announce other defensive tactics or are threatened prior to ESOP adoption. Gordon and Pound classify as threatened firms that are under immediate threat of takeover.

Another possible source of the discrepancy is that my sample includes firms that adopted ESOPs in 1990 and 1991. The other studies do not. Removing observations from 1990 and 1991 leaves 15 threatened firms that experience an average two-day

cumulative abnormal return that is insignificantly different from zero, similar to Chang's anticipatory segment.

Finally, my sample includes 34 ESOPs whose announcements were not found in either the Wall Street Journal Index or Lexus/Nexus databases used by other studies to identify ESOP adopters. So my sample likely includes firms other studies do not, in particular, smaller firms not closely followed by the news services.

Panel *b* of Table 12 reports the 3-day cumulative abnormal average stock price returns by sample segment. Again, there is little difference between the cumulative abnormal returns of the leveraged and nonleveraged segments. And again, the cumulative abnormal returns for the threatened and defensive segments are positive and statistically significant. The difference between 3-day cumulative abnormal returns for threatened and non-threatened firms is significant at the 10% level.

On average, ESOPs increase firm value irrespective of the type of ESOP adopted. However, the market does react to the takeover status and defensive posture of adopting firms, confirming the need to control for corporate control issues.

7.3 Cross-sectional regressions on pooled data

I test the implications that the change in firm value attributable to decreased shirking is positively related to average employee ownership and marginal monitoring costs by regressing the cumulative abnormal stock price returns associated with ESOP announcements on a cross-section of individual firm characteristics. As in Chapter 6, market-to-book ratio, Tobin's Q , and two specifications for research and development proxy for marginal monitoring costs.

The models include variables to control for tax, financing, and voting control effects. A firm must have taxable earnings for ESOP tax shields to have value. Therefore, market reaction should increase with a firm's tax exposure and decrease with the presence of a net-operating-loss carryforward. Firms with high borrowing costs should gain relatively more from reduced ESOP lending rates (Beatty [1995]). Following Beatty, I use debt-to-equity ratio to capture ESOP financing benefits and expect it to be positively related to stock price reaction. But because ESOP tax and financing benefits accrue primarily to leveraged plans, these relationships may be obscured when the sample pools leveraged and nonleveraged plan adopters.

To capture effects related to corporate control issues, the models include changes in the segments of insider ownership. ESOPs change managerial control of voting rights. Stulz [1988] notes that the marginal effect on firm value of changes in managerial voting control depend upon the initial level of managerial control. If an ESOP increases the reservation price of the marginal shareholder, the price received in the event of a successful takeover increases. But as managerial control increases, the likelihood of a successful attempt decreases. Stulz predicts, and Chaplinsky and Niehaus [1994] confirm, a nonlinear stock price reaction to changes in managerial control brought about by an ESOP, first increasing then decreasing as managerial control increases from initially low levels. I follow Chaplinsky and Niehaus and use the changes insider ownership segments to capture any nonlinear effects. Variables that indicate a firm's takeover status and defensive posture complete the voting control category.

Finally, three variables capture miscellaneous effects related to size, risk, and confounding events. The natural log of firm size controls for size effects. Risk is included because it reduces both the expected value of future ESOP tax shields and the incentive effect of stock ownership on risk-averse employees. And because many ESOPs

are announced simultaneously with share repurchase programs, I include an indicator variable equal to one when this is the case, else zero.

Abnormal returns may be related both to the valuation effects of the event itself and to the relation between individual firm characteristics and the extent to which the event is anticipated (Lanen and Thompson [1988]). In this case, the linear relation between firm attributes and the valuation effect of the event can be hidden. The market model with partial anticipation partially addresses this concern. Further mitigating this problem, Prabhala [1997] demonstrates that under certain statistical conditions the OLS approach yields parameter estimates proportional to the true conditional parameters.³⁶

The 3-day cumulative abnormal returns used as the dependent variable are estimated in two ways: by the market model that exhibited the highest average adjusted- R^2 (the two-factor model using the CRSP equal-weighted index as the market proxy) and as excess returns over size-matched portfolios. For each dependent variable, I estimate four different model specifications due to the high collinearity between market-to-book ratio and Tobin's Q , and the two specifications for research and development intensity. I control for scale-related bias by including net sales as an independent variable and calculating t -statistics using White standard errors, as recommended by Barth and Kallapur [1996].³⁷

7.3.1 Full sample announcement effects

Incentive effects. The results, reported in Table 13, only minimally support my theory. As predicted, three-day cumulative abnormal returns are positively related to

³⁶The statistical conditions are that investors are risk-neutral towards the event risk and that conditioning information is a linear signal of expected stock returns.

³⁷To test the sensitivity of the regression results to this method, I estimate one model specification with and without the independent deflator variable and report the results in Appendix 5, Table B. Omitting the independent deflator has only a minimal effect on the results.

both specifications for research and development intensity. The relationships are statistically significant at the 5% level of confidence across all model specifications when abnormal returns are estimated by the two-factor market model. But for abnormal returns estimated as excess returns over size-matched portfolios, the relationship is significant only once (regression (7) in panel *b*), and then only at the 10% level. Neither market-to-book nor Tobin's q have any explanatory power. My theory also predicts a positive relationship between the change in firm value and average fractional employee ownership. The relationship is positive in all regressions, but not statistically significant.

Tax and financing effects. No relationship for variables designed to capture ESOP tax and financing benefits is significant. Either the market attributes little value to these benefits, the selected proxies fail to capture ESOP tax benefits, or the pooling of leveraged and nonleveraged ESOP adopters obscures the relationship in the leveraged ESOP segment. Results in the following section suggest that the latter is the case.

Control effects. Factors related to corporate control help explain ESOP announcement wealth effects, but not at statistically significant levels. The results suggest a nonlinear relationship between stock price reaction and changes in managerial control, consistent with the findings of Chaplinsky and Niehaus [1994]. Market reaction increases as managerial control increases in the 0 to 10% and 10 to 25% ownership segments, then decreases as managerial control increases beyond 25%. The presence of takeover threats or rumors prior to the ESOP announcement adds approximately 2 percentage points (1.5 when estimated as excess returns over size-matched portfolios) to cumulative abnormal returns; an aggressive defensive posture adds approximately 1 percentage point. But neither effect is statistically significant.³⁸ Dhillon and Ramierz

³⁸The statistical significance of the relationship between abnormal returns and insider ownership and the presence of takeover threats or rumors is sensitive to model specification. When inside ownership is not segmented, the relationship is negative and statistically significant at the 10% level of confidence. When the independent deflator

[1994] and Chaplinsky and Niehaus [1994] also find a positive but statistically insignificant relationship between takeover threats and cumulative abnormal returns.

The simultaneous announcement of a share repurchase plan adds between 2.2 and 2.4 percentage points to cumulative abnormal returns. The effect is similar in size to that found by Chaplinsky and Niehaus [1994]. Firm size is negatively related to announcement period abnormal returns, consistent with Chang and Mayers [1992] and Chaplinsky and Niehaus [1994]. But, unlike Chang and Mayers, the relationship is not statistically significant.

While I do find a statistically significant positive relationship between cumulative abnormal returns and two proxies for marginal monitoring costs, my models fit the data less well than previous studies. Beatty [1995], Chang and Mayers [1992], and Dhillon and Ramirez [1994] report F -statistics that are statistically significant. No F -statistic in my regressions is. Likewise, the adjusted- R^2 s of my models are considerably smaller, less than 0.05 versus 0.15 to 0.20 in other studies.

7.4 Wealth effects by the type of ESOP adopted.

The analysis in Chapter 2 implies that leveraged and nonleveraged ESOPs serve different clienteles. The insignificant Hausman test statistics from the multinomial logit regressions in Chapter 5 and the rejection of the null hypothesis that all nonleveraged coefficients equal zero in Chapter 6 support this notion. The poor fit of the models in the previous section may result from pooling leveraged and nonleveraged adopters. I therefore re-estimate the models in Table 13, this time allowing the intercept and slope coefficients to vary with the type of ESOP announced. I report the results in Table 14.

variable (net sales) is omitted, the marginal effect of the presence of takeover threats is significant at the 10% level. I report these sensitivity test results in Appendix 5, Table B.

Separating the effects for leveraged and nonleveraged ESOP announcements considerably increases the explanatory power of the models. Adjusted- R^2 s for regressions that use abnormal returns estimated by the two-factor market model as the dependent variable increase to 0.20, comparable to previous studies. Similarly, regression F -statistics increase, becoming statistically significant at the 10% level of confidence. Adjusted- R^2 s and F -statistics also increase in the regressions on segmented data that use cumulative abnormal returns estimated as excess returns over size-matched portfolios as the dependent variable. But the F -statistics do not achieve statistically significant levels.

Incentive effects. The increased power of the segmented regressions only minimally increases support for the proposition that firm value increases (shirking decreases) with marginal monitoring costs. Market reaction still increases with research and development intensity for both types of ESOPs, at higher levels of statistical significance than was the case for pooled data. But, tempering this support, the marginal effects of market-to-book ratio and Tobin's Q remain insignificantly different from zero.

The implication that firm value increases with the level of employee ownership receives no support from the leveraged segment and is rejected by the nonleveraged segment. Market reaction to a nonleveraged ESOP announcement decreases as average employee ownership increases. This could reflect a potential defensive intent for nonleveraged ESOPs. When initiated, nonleveraged plans typically hold few if any shares. By initiating a nonleveraged plan that holds many shares, management may signal its intention to entrench itself. For leveraged ESOPs, though, placing a large number of shares into a plan does not unambiguously signal managerial entrenchment because tax and financing benefits are positively correlated with the size of an ESOP.

Tax and financing effects. Tax and financing effects clearly differentiate the market's reaction to leveraged and nonleveraged ESOP announcements. For leveraged ESOPs, the relationships between market reaction and the presence of a net-operating-loss carryforward, tax exposure, and debt-to-equity ratio are in the predicted directions and statistically significant across all models specifications and dependent variables. Market reaction decreases in the presence of a net-operating-loss carryforward and increases with tax exposure and debt-to-equity ratio. These findings are consistent with Beatty [1995].

The market does not appear to assign tax and financing benefits to nonleveraged plans. Rather than decreasing, market reaction to nonleveraged ESOP announcements increases with the presence of a net-operating-loss carryforward. Nor do clear relationships exist between market reaction and tax exposure or debt-to-equity ratio. Tax exposure's net marginal effect is ambiguous and only weakly significant. It is small and positive when abnormal returns are estimated by a two-factor market model, small and negative when abnormal returns are estimated as excess returns. Debt-to-equity ratio has no net marginal effect.

A lack of tax benefits, however, does not explain the positive relationship between market reaction to nonleveraged ESOP announcements and the presence of a net-operating-loss carryforward. But the positive relationship is consistent with an incentive story for nonleveraged ESOPs if the market views nonleveraged ESOPs as attempts by an inefficient firms to motivate their employees.

The analysis in Chapter 2 implies that the differences between leveraged and nonleveraged ESOP adopters derive from their ability to capitalize ESOP tax and financing benefits (Proposition 6), not from the incentive effects of employee stock ownership (Proposition 5). To test these implications, I calculate F -statistics to test the

joint significance of all nonleveraged coefficients in each variable category. The results support both propositions. The null hypothesis of no difference between leveraged and nonleveraged ESOP tax and financing effects is rejected for all 8 regressions; the null hypothesis of no difference between employee incentive effects never is.

Control effects. None of the variables selected to capture corporate control effects appears to significantly affect market reaction to either type of ESOP announcement. But the market does react differently to changes in insider ownership segments depending on the type of ESOP adopted. For leveraged ESOP announcements, market reaction increases as managerial control increases from 0 to 10% and 10 to 25%, then decreases. For nonleveraged ESOP announcements, there is virtually no market reaction as managerial control increases from 0 to 10% and 10 to 25%, then a positive reaction as managerial control increases beyond 25%. However, few of the net marginal effects for either type of adopter are statistically significant at even the 10% level, and only the difference between leveraged and nonleveraged adopters for the change in the 10 to 25% ownership segment is statistically significant.

Finally, market reaction to nonleveraged ESOP announcements decreases as risk increases. The relationships are significant at the 5% level for systematic risk (panel *a*) and the 10% level for total risk (panel *b*). This finding is also consistent with an incentive story for nonleveraged ESOPs. When employees are risk averse, risk reduces the incentive effect of stock ownership.

7.5 Summary

The type of ESOP adopted appears to be a response to different internal firm structures and dynamics. At the margin, investors react positively to announcements of smaller (lower levels of average individual employee ownership) nonleveraged ESOPs by

firms that operate inefficiently (indicated by the presence of a net-operating-loss carryforward), operate in low risk environments, and require large investments in human capital (high research and development intensity). The market reacts positively to announcements of larger leveraged ESOPs by firms that are profitable (exhibit a high proportion of operating income exposed to taxation) and require large investments in human capital. Both scenarios are consistent with a market that assigns positive value to the incentives created by employee stock ownership. The results, however, should be interpreted with caution, especially when generalizing to the population of firms that adopt ESOPs. The sample size is relatively small, the results vary by model specification, the regressions explain only a small portion of the variation in cumulative abnormal returns, and the proxies attempt to measure unobservable attributes.

TABLE 9: Distribution by industry and firm size for 87 firms that adopt ESOPs between 1986 and 1991. Standard Industrial Classification (SIC) codes are as defined by Compustat at the end of the year preceding the firm's decision to adopt an ESOP. Each firm's decile is determined by the CRSP data set for NYSE and AMEX firms, or, if not reported, by capitalization break points reported in the CRSP data set.

SIC Code	Deciles										Total
	<i>Smallest</i> 10	9	8	7	6	5	4	3	2	<i>Largest</i> 1	
13				1							1
20			1	1					1	1	4
22					1						1
25				1	3						4
26						1	1				2
28		1					1	2	2	1	7
29								1	1		2
30		1									1
33		1		1			1				3
34		1	2	1							4
35	1	2	1	2	1					1	8
36	1	3				1			1	1	7
37	1										1
38	1	3	2						3		9
39			1								1
44	1										1
45				1							1
49			1		2			1	3	1	8
50	1										1
51								3			3
54	1										1
58					1						1
59							1				1
60			1				1			2	4
62		1		1							2
63						1					1
73					1			1			2
76	1										1
79		1									1
80	1							1			2
87	1				1						2
<i>Total</i>	10	14	9	9	10	3	5	9	11	7	87

TABLE 10: Average abnormal daily stock price returns for 87 firms around date that the decision to adopt an ESOP is announced.

Average abnormal daily stock price returns for firms announcing the decision to adopt or significantly expand an ESOP from 1986 through 1991. Columns 1 and 3 report daily abnormal returns calculated using a single factor market model that accounts for partially anticipated events. Columns 2 and 4 report daily abnormal returns calculated using a two factor market model that accounts for partially anticipated events. Column 5 reports average daily returns in excess of size-matched portfolios. The z -statistic for market model regressions, which is distributed standard normal under the null hypothesis of 0 abnormal performance, and the t -statistic for excess returns over size-matched portfolios are reported in parentheses.

<i>Market proxy:</i>	One and two-factor market models (CRSP Indices)				Excess return over size- matched portfolios
	VWRET	VWRET	EWRET	EWRET	
<i>Factors</i>					
Index	0.72*** (49.9)	0.87*** (48.2)	1.07*** (52.2)	1.04*** (48.6)	
NASDAQ- S&P500		0.391*** (14.96)		-0.021*** (-2.93)	
<i>Event day</i>					
-20	-0.0034 (-1.61)	-0.0031 (-1.52)	-0.0032 (-1.41)	-0.0031 (-1.54)	-0.0021 (-0.75)
-19	-0.0002 (0.32)	0.0004 (0.53)	0.0005 (0.43)	0.0011 (0.68)	0.0009 (0.28)
-18	0.0020 (0.67)	0.0015 (0.54)	0.0021 (0.84)	0.0017 (0.63)	0.0029 (0.82)
-17	0.0021 (0.48)	0.0020 (0.52)	0.0019 (0.59)	0.0019 (0.52)	0.0027 (0.93)
-16	-0.0019 (-0.07)	-0.0018 (-0.01)	-0.0017 (0.01)	-0.0020 (-0.13)	-0.0016 (-0.46)
-15	-0.0020 (-0.81)	-0.0022 (-0.84)	-0.0014 (-0.34)	-0.0018 (-0.65)	-0.0008 (-0.36)
-14	-0.0081* (-1.72)	-0.0058 (-0.88)	-0.0077 (-1.56)	-0.0061 (-0.93)	-0.0065** (-2.03)
-13	0.0077*** (3.01)	0.0077*** (2.95)	0.0075*** (2.91)	0.0078*** (2.99)	0.0077** (2.12)
-12	-0.0009 (-0.60)	0.0006 (0.17)	-0.0000 (-0.08)	0.0004 (0.06)	0.0013 (0.49)
-11	-0.0002 (0.43)	-0.0001 (0.33)	-0.0007 (0.08)	-0.0002 (0.27)	-0.0001 (-0.04)
-10	0.0008 (0.07)	0.0012 (0.26)	0.0012 (0.19)	0.0012 (0.23)	0.0012 (0.32)
-9	-0.0011 (-0.05)	0.0002 (0.49)	-0.0002 (0.18)	0.0008 (0.58)	0.0001 (0.02)
-8	-0.0066** (-2.05)	-0.0062* (-1.80)	-0.0058* (-1.68)	-0.0057* (-1.68)	-0.0047 (-1.21)

TABLE 10, cont.: Average abnormal daily stock returns around the date that the decision to adopt an ESOP is announced.

<i>Factors:</i>	One and two-factor market models (CRSP Indices)				Excess return
	VWRET D	VWRET D + SIZE	EWRET D	EWRET D + SIZE	
<i>Event day, cont.</i>					
-7	0.0054 (0.68)	0.0053 (0.69)	0.0054 (0.62)	0.0057 (0.77)	0.0070 (1.30)
-6	-0.0021 (-1.09)	-0.0027 (-1.34)	-0.0024 (-1.23)	-0.0025 (-1.30)	-0.0015 (-0.53)
-5	0.0022 (0.75)	0.0016 (0.49)	0.0015 (0.37)	0.0015 (0.42)	0.0039* (1.64)
-4	0.0027 (0.36)	0.0026 (0.32)	0.0021 (0.02)	0.0025 (0.17)	0.0032 (1.06)
-3	0.0010 (0.79)	0.0005 (0.53)	0.0007 (0.59)	0.0005 (0.53)	0.0018 (0.32)
-2	-0.0012 (-0.01)	-0.0016 (-0.16)	-0.0018 (-0.36)	-0.0017 (-0.29)	-0.0007 (-0.20)
-1	0.0003 (0.38)	-0.0003 (0.28)	0.0002 (0.40)	-0.0003 (0.27)	0.0011 (0.34)
0	0.0055** (2.05)	0.0056** (2.12)	0.0050** (1.93)	0.0054** (2.09)	0.0055 (1.49)
1	0.0024 (1.24)	0.0023 (1.27)	0.0018 (0.97)	0.0018 (1.05)	0.0014 (0.34)
2	-0.0011 (-0.62)	-0.0008 (-0.43)	-0.0015 (-0.65)	-0.0013 (-0.55)	-0.0007 (-0.30)
3	-0.0009 (0.49)	-0.0011 (0.44)	-0.0014 (0.36)	-0.0014 (0.36)	-0.0016 (-0.54)
4	-0.0021 (-0.86)	-0.0016 (-0.70)	-0.0015 (-0.71)	-0.0014 (-0.65)	-0.0013 (-0.40)
5	0.0034* (1.70)	0.0036* (1.91)	0.0033* (1.73)	0.0031* (1.73)	0.0034 (0.64)
6	0.0039 (1.38)	0.0039 (1.28)	0.0045 (1.56)	0.0041 (1.33)	0.0055 (1.48)
7	-0.0003 (0.32)	-0.0001 (-0.33)	-0.0005 (0.20)	-0.0001 (0.31)	0.0008 (0.32)
8	0.0027 (0.86)	0.0027 (0.82)	0.0031 (0.98)	0.0033 (1.03)	0.0043 (1.37)
9	0.0002 (0.22)	-0.0003 (0.07)	-0.0003 (0.05)	-0.0004 (0.01)	0.0009 (0.30)
10	-0.0023 (-0.65)	-0.0030 (-0.87)	-0.0028 (-0.80)	-0.0030 (-0.88)	-0.0024 (-1.09)

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

TABLE 11: Cumulative average abnormal daily stock price returns for 87 firms around the date that the decision to adopt an ESOP is announced.

Cumulative average abnormal daily stock price returns for 87 firms that announced the decision to adopt or significantly expand an ESOP in years 1986 through 1991. Columns 1 and 3 report cumulative abnormal returns calculated with a single factor market model that accounts for partially anticipated events. Columns 2 and 4 report cumulative average abnormal returns calculated using a two-factor market model that accounts for partially anticipated events. Column 5 reports cumulative average abnormal returns in excess of size-matched portfolios. The z -statistic for market model regressions, which is distributed standard normal under the null hypothesis of 0 abnormal performance, and the t -statistic for excess returns over size-matched portfolios are reported in parentheses.

<i>Market proxy:</i>	One and two-factor market models (CRSP Indices)				Excess return over size- matched portfolios
	VWRETD	VWRETD + SIZE	EWRETD	EWRETD + SIZE	
<i>Cumulation interval relative to the event data</i>					
[-20, -1]	-0.0036 (0.66)	-0.0000 (0.35)	-0.0017 (0.13)	0.0015 (0.36)	0.0157 (1.50)
[-10, -1]	0.0013 (-0.02)	0.0008 (-0.07)	0.0008 (-0.25)	0.0021 (-0.09)	0.0114 (1.31)
[0, 1]	0.0079** (2.33)	0.0080** (2.40)	0.0068** (2.05)	0.0072** (2.22)	0.0069 (1.27)
[-1, 1]	0.0082** (2.12)	0.0077** (2.12)	0.0070* (1.90)	0.0069** (1.97)	0.0080 (1.32)
[2, 10]	0.0034 (0.94)	0.0033 (0.96)	0.0029 (0.91)	0.0028 (0.90)	0.0090 (0.99)
[-20, 10]	0.0077 (1.11)	0.0113 (1.41)	0.0080 (1.11)	0.0116 (1.34)	0.0316** (2.39)

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

TABLE 12: Cumulative average 2- and 3-day abnormal daily stock price returns by sample segment around the date that the decision to adopt an ESOP is announced.

Cumulative average abnormal daily stock returns for 87 firms that announced the decision to adopt or significantly expand an ESOP in years 1986 through 1991. The data is segmented by 1) the type of ESOP adopted (leveraged or nonleveraged); 2) the presence of takeover threats or rumors during the two years prior to ESOP adoption; and 3) the decision of the firm to implement takeover defenses, other than an ESOP, during the two years prior to adoption. Column 1 reports results from fitting a two-factor market model with partial anticipation using the CRSP equal-weighted index for the market proxy and the difference between returns on the CRSP NASDAQ and S&P500 indices as the size factor. Column 2 reports cumulative excess abnormal returns over size-matched portfolios. The z -statistic for market model regressions, which is distributed standard normal under the null hypothesis of 0 abnormal performance, and the t -statistic for excess returns over matched capitalization portfolios are reported in parentheses.

<i>Sample segment (number of observations)</i>	(1)		(2)	
	Two factor market model		Excess return	
	Cumulative abnormal return ^a	Difference ^b	Cumulative abnormal return ^b	Difference ^b
Leveraged ESOPs (54)	0.0062* (1.91)	-0.0004 (0.03)	0.0059 (0.81)	-0.0014 (0.12)
Nonleveraged ESOPs (27)	0.0066 (1.07)		0.0073 (0.83)	
Presence of takeover threats or rumors during 2 years prior to adoption (22)	0.0208*** (2.64)	0.0182 (1.11†)	0.0209 (1.45)	0.0187 (1.21†)
No known takeover threats or rumors during 2 years prior to adoption (65)	0.0026 (1.03)		0.0022 (0.41)	
Other takeover defenses adopted during the 2 years prior to adoption (30)	0.0162*** (3.06)	0.0138 (1.17)	0.0158 (1.45)	0.0135 (1.19)
No known takeover defenses adopted during the 2 years prior to adoption (57)	0.0024 (0.52)		0.0023 (0.38)	

TABLE 12 cont.: Cumulative average 2- and 3-day abnormal daily stock price returns for sample segments around the date that the decision to adopt an ESOP is announced.

----- Panel b: 3-day cumulative abnormal daily stock returns -----

Sample segments (number of observations)	(1)		(2)	
	Two factor market model		Excess return	
	Cumulative abnormal return ^a	Difference ^b	Cumulative abnormal return ^b	Difference ^b
Leveraged ESOPs (54)	0.0079* (1.78)	0.0008 (0.06)	0.0087 (1.08)	-0.0010 (-0.07)
Nonleveraged ESOPs (27)	0.0071 (0.96)		0.0097 (0.92)	
Presence of takeover threats or rumors during 2 years prior to adoption (22)	0.0282*** (2.77)	0.0285* (1.67†)	0.0312** (2.05)	0.0310* (1.89†)
No known takeover threats or rumors during 2 years prior to adoption (65)	-0.0003 (0.66)		0.0002 (0.03)	
Other defensive measures taken during the 2 years prior to adoption (30)	0.0198*** (2.83)	0.0197 (1.54)	0.0209* (1.71)	0.0197 (1.55)
No other known defensive measures taken during the 2 years prior to adoption (57)	0.0001 (0.38)		0.0012 (0.19)	

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

^az-statistic in parentheses

^bt-statistic in parentheses

†An *F*-test for unequal variances is performed, where $F = (\text{larger of } s_1^2, s_2^2) / (\text{smaller of } s_1^2, s_2^2)$. If the null hypothesis of equal variances is not rejected at the 0.05 level of significance, the *t*-statistic reported is

$$t = (\bar{x}_1 - \bar{x}_2) / \sqrt{s^2 (1/n_1 + 1/n_2)}. \text{ If the null is rejected, the reported } t\text{-statistic is}$$

$$t = (\bar{x}_1 - \bar{x}_2) / \sqrt{s_1^2 / n_1 + s_2^2 / n_2} \text{ and the indicated } p\text{-values are estimated as per Cochran and Cox [1950].}$$

TABLE 13: Results from regressing 3-day cumulative abnormal returns on a pooled cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms.

Results from regressing 3-day cumulative abnormal daily stock price returns on a cross section of firm attributes to measure the effects of employee, tax, and control incentives on investor reaction to the decision to adopt an ESOP. Cumulative abnormal returns are estimated two ways: by a two-factor market model with partial anticipation or as excess returns over size-matched portfolios. The independent variables are defined as follows: market-to-book ratio is the ratio of market value to book value of equity; Tobin's Q is the ratio of the market value of a firm's assets to their replacement cost; research and development intensity is research and development expense divided by either number of employees (1) or net sales (2); capital intensity is gross plant, property, and equipment per employee; NOL is a binary variable equal to one if the firm reports a net-operating-loss carryforward, else zero; tax ratio is the ratio of operating income less interest and amortization divided by operating income; debt-to-equity ratio is the ratio of the book value of debt to the market value of equity; change in insider ownership is the change in ownership segments engendered by adopting an ESOP; defense is a binary variable equal to 1 if the firm initiates an anti-takeover tactic during the two years prior to adopting an ESOP, else zero; threat is a binary variable equal to 1 if the firm is the subject of takeover threats or rumors during the two years prior to adopting an ESOP, else zero; size is the natural log of the market value of equity; beta and root-mean-squared error are estimated parameters from the two factor market model; standard deviation of returns is the standard deviation of daily stock price returns from 240 days before to 59 days after the ESOP announcement; and repurchase plan is a binary variable equal to one if a stock repurchase plan is announced simultaneously with the decision to adopt an ESOP. All observations are for the year ending just prior to the year in which an ESOP decision is announced. Four different specifications of employee incentive variables are reported due to the high degree of collinearity between market-to-book ratio and Tobin's Q and use of two different research and development specifications. Net sales is used as an independent deflator variable and t -statistics calculated using White standard deviations as per Barth and Kallapur [1996].

<i>Variables</i>	Dependent variable: 3-day cumulative abnormal returns estimated by a two factor market model with anticipation.				Dependent variable: 3-day cumulative abnormal returns estimated as excess returns over size-matched portfolios.			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Employee incentives</i>								
Market to book	-0.0059 (-0.87)	-0.0062 (-0.90)			-0.0058 (-0.75)	-0.0062 (-0.78)		
Tobin's Q			0.00657 (0.37)	0.00627 (0.35)			0.00560 (0.32)	0.00502 (0.28)
R&D intensity 1 (R&D/employee)	0.00214** (2.46)		0.00222** (2.48)		0.00151 (1.65)		0.00159* (1.70)	
R&D intensity 2 (R&D/net sales)		0.0558** (2.53)		0.0584** (2.58)		0.0310 (1.44)		0.0334 (1.54)

TABLE 13, cont.: Results from regressing 3-day cumulative abnormal returns on a pooled cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms.

	Dependent variable: 3-day cumulative abnormal returns estimated by a two factor market model with anticipation.			Dependent variable: 3-day cumulative abnormal returns estimated as excess returns over size-matched portfolios.				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Employee incentives, cont.</i>								
Average percentage of employee ownership	0.00162 (1.24)	0.00164 (1.22)	0.00105 (0.85)	0.00106 (0.84)	0.00069 (0.53)	0.00082 (0.60)	0.00019 (0.16)	0.00031 (0.26)
<i>Employee influence</i>								
Capital intensity	-0.00003 (-1.28)	-0.00003 (-1.31)	-0.00002 (-0.99)	-0.00002 (-1.06)	-0.00002 (-0.82)	-0.00002 (-0.87)	-0.000010 (-0.51)	-0.000012 (-0.59)
<i>Tax incentives</i>								
Net operating loss carryforward	0.00254 (0.14)	0.00607 (0.34)	0.00415 (0.23)	0.00788 (0.44)	0.00591 (0.32)	0.00802 (0.44)	0.00728 (0.39)	0.00958 (0.53)
Tax ratio	-0.0056 (-0.32)	-0.0047 (-0.27)	-0.0064 (-0.37)	-0.0057 (-0.32)	0.00467 (0.26)	0.00614 (0.33)	0.00371 (0.21)	0.0051 (0.28)
Debt to equity	0.0155 (0.83)	0.0140 (0.75)	0.0164 (0.84)	0.0148 (0.76)	0.0186 (0.99)	0.0172 (0.93)	0.0193 (0.95)	0.0179 (0.93)
<i>Corporate control</i>								
Change in 0-10% ownership	0.00197 (1.20)	0.00229 (1.39)	0.00272 (1.49)	0.00306* (1.67)	0.00249 (1.55)	0.00264 (1.60)	0.00316* (1.87)	0.00332* (1.91)
Change in 10-25% ownership	0.00051 (0.29)	0.00057 (0.33)	0.00101 (0.64)	0.00108 (0.69)	0.00058 (0.32)	0.00054 (0.29)	0.00104 (0.63)	0.00100 (0.59)
Change in 25+% ownership	-0.0027* (-1.70)	-0.0026* (-1.68)	-0.0019 (-1.03)	-0.0019 (-1.01)	-0.0016 (-1.05)	-0.0018 (-1.12)	-0.00101 (-0.58)	-0.00118 (-0.66)
Defense	0.00886 (0.64)	0.0110 (0.77)	0.0101 (0.74)	0.0124 (0.86)	0.0100 (0.72)	0.0112 (0.80)	0.0111 (0.81)	0.0124 (0.89)
Threat	0.0193 (1.40)	0.0188 (1.35)	0.0214 (1.49)	0.0209 (1.44)	0.0145 (1.06)	0.0141 (1.03)	0.0165 (1.16)	0.0161 (1.13)

TABLE 13, cont.: Results from regressing 3-day cumulative abnormal returns on a pooled cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms.

<i>Miscellaneous</i>	Dependent variable: 3-day cumulative abnormal returns estimated by a two factor market model with anticipation.			Dependent variable: 3-day cumulative abnormal returns estimated as excess returns over size-matched portfolios.				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size	0.0024 (0.31)	0.00307 (0.39)	-0.0018 (-0.20)	-0.0011 (-0.13)	-0.00032 (-0.04)	0.00062 (0.08)	-0.00387 (-0.51)	-0.00293 (-0.38)
Beta	-0.0293* (-1.96)	-0.0275* (-1.89)	-0.0287* (-1.88)	-0.0269* (-1.78)				
Root-mean-squared error	0.238 (0.34)	0.238 (0.33)	0.0691 (0.09)	0.0681 (0.08)				
Standard deviation of returns					-0.140 (-0.24)	-0.0616 (-0.11)	-0.247 (-0.40)	-0.166 (-0.26)
Repurchase plan	0.0195* (1.83)	0.0189* (1.77)	0.0188* (1.78)	0.0181* (1.71)	0.0218* (1.97)	0.0215* (1.94)	0.0210* (1.94)	0.0206* (1.90)
<i>Independent deflator</i>								
Net sales	-0.000007* (-1.82)	-0.000007* (-1.87)	-0.000004 (-1.21)	-0.000004 (-1.24)	-0.000007* (-1.67)	-0.000007* (-1.72)	-0.000005 (-1.23)	-0.000005 (-1.28)
Constant	0.00676 (0.17)	0.00413 (0.10)	0.0118 (0.31)	0.00941 (0.24)	-0.0061 (-0.15)	-0.0103 (-0.24)	-0.0027 (-0.07)	-0.0067 (-0.16)
F-statistic	1.17 (0.32)	1.10 (0.38)	1.16 (0.32)	1.08 (0.39)	0.95 (0.52)	0.90 (0.58)	0.94 (0.53)	0.88 (0.59)
Adjusted-R ²	0.04	0.02	0.04	0.02	-0.01	-0.02	-0.01	-0.03

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

TABLE 14 cont.: Results from regressing 3-day cumulative abnormal returns on a cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms -- separate leveraged and nonleveraged effects.

	(1)		(2)		(3)		(4)	
	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance
<i>Employee ownership</i>								
Average percentage of employee ownership	0.00085 (0.65)	-0.0255***†† (-2.90)	0.00145 (1.02)	-0.0304***††† (-2.82)	-0.00034 (-0.28)	-0.0239***††† (-2.75)	0.00021 (0.17)	-0.0293***††† (-2.73)
<i>Employee influence</i>								
Capital intensity	0.00002 (0.48)	-0.00010 (-1.67)	0.00001 (0.34)	-0.00010 (-1.66)	0.00005 (1.45)	-0.00013** (-2.35)	0.00004 (1.28)	-0.00013** (-2.31)
<i>Tax incentives^b</i>								
Net operating loss carryforward	-0.0663** (-2.18)	0.176***††† (4.21)	-0.0724** (-2.19)	0.188***††† (4.07)	-0.0565** (-2.14)	0.164***††† (4.33)	-0.0607** (-2.11)	0.176***††† (4.16)
Tax ratio	0.0954** (2.38)	-0.114**† (-2.70)	0.0977** (2.44)	-0.118***† (-2.80)	0.0978** (2.43)	-0.112**† (-2.62)	0.0994** (2.44)	-0.120***† (-2.78)
Debt to equity	0.0820** (2.23)	-0.0472 (-1.08)	0.0869** (2.26)	-0.0665 (-1.46)	0.0747** (2.24)	-0.0386 (-0.95)	0.0786** (2.24)	-0.0572 (-1.35)
<i>Corporate control</i>								
Change in 0-10% ownership	0.50 (0.64)	0.85 (-0.115)	0.63 (0.59)	0.78 (-1.21)	0.59 (1.62)	0.78 (-1.72)	0.70 (1.51)	0.67 (-1.36)
Change in 10-25% ownership	0.00126 (1.22)	-0.0173*** (-2.74)	0.00119 (1.20)	-0.0138** (-2.22)	0.00312 (1.70)	-0.0124* (-2.83)	0.00295 (1.68)	-0.0112 (-2.25)
Change in 25+% ownership	0.00185 (-0.81)	0.00913 (1.64)	-0.00255 (-1.03)	0.00977 (1.63)	-0.00034 (-0.16)	0.00758 (1.39)	-0.00101 (-0.47)	0.00837 (1.43)
Defense	0.00446 (0.30)	0.00152 (0.53)	0.00446 (0.32)	0.0279 (0.99)	0.00736 (0.47)	0.00862 (0.28)	0.00777 (0.52)	0.0243 (0.83)
Threat	0.00688 (0.45)	-0.0221 (-0.86)	0.00931 (0.61)	-0.0322 (-1.30)	0.0176 (1.11)	-0.0317 (-1.19)	0.0189 (1.19)	-0.0411 (-1.60)

TABLE 14 cont.: Results from regressing 3-day cumulative abnormal returns on a cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms -- separate leveraged and nonleveraged effects.

	(1)		(2)		(3)		(4)	
	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance
<i>Miscellaneous^b</i>	2.33*		1.68		2.62*		2.30*	
Size	0.00252 (0.28)	-0.00936 (-0.75)	0.00649 (0.67)	-0.0123 (-0.91)	-0.00823 (-0.84)	-0.00056 (-0.04)	-0.00436 (-0.45)	-0.00303 (-0.22)
Beta	0.00257 (0.17)	-0.0832***†† (-3.69)	-0.00420 (-0.25)	-0.0747***†† (-3.33)	0.00121 (0.08)	-0.0805***†† (-3.65)	-0.00411 (-0.25)	-0.0741***†† (-3.31)
Root-mean-squared error	1.01 (0.88)	-1.69 (-1.19)	1.03 (0.94)	-1.57 (-1.07)	1.00 (0.91)	-1.76 (-1.26)	1.01 (0.95)	-1.60 (-1.09)
Repurchase plan	0.00791 (0.77)	0.00651 (0.34)	0.0103 (0.97)	-0.00288 (-0.15)	0.00289 (0.27)	0.0119 (0.60)	0.00504 (0.47)	0.00245 (0.13)
Constant	-0.119** (-2.61)	0.223*** (3.70)	-0.139** (-2.70)	0.268*** (3.51)	-0.100** (-2.28)	0.204*** (3.32)	-0.116** (-2.44)	0.249*** (3.29)
<i>Independent deflator</i>								
Net sales	-0.000007 (-1.51)		-0.000008* (-1.72)		-0.000001 (-0.37)		-0.000003 (-0.75)	
F-statistic (p-value)	1.54* (0.10)		1.54* (0.10)		1.57* (0.09)		1.53 (0.10)	
Adjusted-R ²	0.20		0.20		0.21		0.20	

TABLE 14 cont.: Results from regressing 3-day cumulative abnormal returns on a cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms -- separate leveraged and nonleveraged effects.

----- Panel b: Dependent variable: 3-day cumulative abnormal returns estimated as excess returns over size-matched portfolios -----

Variables ^a	(5)		(6)		(7)		(8)	
	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance
<i>Employee incentives^b</i>								
Market to book	-0.00438 (-0.49)	0.00905 (0.76)	-0.00627 (-0.67)	0.00031 (0.02)	0.0229 (1.28)	-0.0133 (-0.58)	0.0192 (1.13)	-0.0226 (-0.98)
Tobin's Q								
R&D intensity 1 (R&D/employee)	0.00635* (2.01)	0.00164†† (0.37)	0.860** (2.07)	-0.595†† (0.43)	0.00527* (1.82)	0.00274†† (1.01)	0.692* (1.87)	-0.423†† (-1.09)
R&D intensity 2 (R&D/net sales)								
<i>Employee ownership</i>								
Average percentage of employee ownership	0.00026 (0.19)	-0.0258**† (-1.25)	0.00074 (0.53)	-0.0288**† (-2.10)	-0.00086 (-0.75)	-0.0248**†† (-2.23)	-0.00042 (-0.38)	-0.0280**† (-2.07)
<i>Employee influence</i>								
Capital intensity	0.00004 (1.17)	-0.00016* (-1.99)	0.00004 (0.95)	-0.00016** (-2.12)	0.00007** (2.21)	-0.00019* (-2.43)	0.00006* (2.00)	-0.00019** (-2.62)

TABLE 14 cont.: Results from regressing 3-day cumulative abnormal returns on a cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms -- separate leveraged and nonleveraged effects.

	(5)		(6)		(7)		(8)	
	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance
<i>Tax incentives^b</i>		3.23**		3.30**		3.36**		3.33**
Net operating loss carryforward	-0.0599* (-1.92)	0.168***†† (3.72)	-0.0642* (-1.98)	0.176***†† (3.57)	-0.0518* (-1.91)	0.160***†† (3.82)	-0.0543* (-1.94)	0.167***†† (3.63)
Tax ratio	0.109** (2.56)	-0.0842*† (-1.84)	0.110** (2.66)	-0.0863*† (-1.95)	0.111** (2.65)	-0.0840*† (-1.87)	0.112** (2.68)	-0.0890*† (-1.99)
Debt to equity	0.0746** (2.07)	0.00167† (0.04)	0.0807** (2.11)	-0.0167 (-0.36)	0.0685** (2.12)	0.00946† (0.22)	0.0730** (2.13)	-0.0075† (-0.17)
<i>Corporate control</i>	0.36	2.13	0.44	2.00	0.51	2.00	0.55	1.82
Change in 0-10% ownership	0.00149 (0.66)	-0.0102 (-0.86)	0.00151 (0.66)	-0.00982 (-0.79)	0.00329 (1.49)	-0.0107 (-0.92)	0.00324 (1.50)	-0.0106 (-0.86)
Change in 10-25% ownership	0.00144 (0.87)	-0.0278*** (-3.59)	0.00150 (0.96)	-0.0252*** (-3.41)	0.00195 (1.30)	-0.0290***† (-3.70)	0.00193 (1.36)	-0.0259*** (-3.47)
Change in 25+% ownership	-0.00171 (-0.76)	0.0142***† (2.09)	-0.00207 (-0.90)	0.0141* (1.93)	-0.00004 (-0.02)	0.0128*† (1.94)	-0.00052 (-0.26)	0.0128*† (1.82)
Defense	0.00112 (0.08)	-0.0109 (-0.32)	0.00257 (0.18)	-0.00257 (-0.08)	0.00348 (0.24)	-0.0157 (-0.45)	0.00511 (0.36)	-0.00478 (-0.14)
Threat	0.0138 (0.85)	-0.00270 (-0.07)	0.0144 (0.89)	-0.0104 (-0.30)	0.0232 (0.24)	-0.0116 (-0.32)	0.0232 (1.44)	-0.0190 (-0.53)

TABLE 14 cont.: Results from regressing 3-day cumulative abnormal returns on a cross section of level data for 48 leveraged and 25 nonleveraged ESOP adopting firms -- separate leveraged and nonleveraged effects.

----- Panel b, cont.: Dependent variable: 3-day cumulative abnormal returns estimated as excess returns over size-matched portfolios -----

	(5)		(6)		(7)		(8)	
	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance
Miscellaneous ^b		2.50*		1.92		2.57*		2.03
Size	-0.00297 (-0.31)	-0.00997 (-0.70)	0.00078 (0.08)	-0.0116 (-0.85)	-0.0127 (-1.33)	-0.00228 (-0.16)	-0.00921 (-1.00)	-0.00321 (-0.24)
Standard deviation of returns	1.44 (1.56)	-3.91***† (-2.93)	1.16 (1.36)	-3.43***† (-3.03)	1.42 (1.58)	-3.97***† (-3.00)	1.21 (1.43)	-3.52***† (-2.65)
Repurchase plan	0.0106 (0.94)	0.0199 (0.88)	0.0134 (1.17)	0.0107 (0.46)	0.00615 (0.53)	0.0252 (1.10)	0.00844 (0.73)	0.0161 (0.69)
Constant	-0.1111** (-2.21)	0.173** (2.63)	-0.131** (-2.34)	0.207*** (2.93)	-0.0991** (-2.10)	0.162** (2.61)	-0.114** (-2.26)	0.194*** (2.88)
Independent deflator								
Net sales	-0.000004 (-0.80)		-0.000005 (-1.09)		-0.000002 (-0.42)		-0.0000001 (-0.01)	
F-statistic (p-value)	1.26 (0.24)		1.26 (0.24)		1.32 (0.20)		1.29 (0.22)	
Adjusted-R ²	0.11		0.10		0.12		0.11	

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively
 †††, ††, † Sum of leveraged and nonleveraged coefficients significant at the 0.01, 0.05, or 0.10 level of confidence, respectively
^aNumbers reported in row are F-statistics for the joint significance of all nonleveraged coefficients
^bNumbers reported after incentive, tax, and miscellaneous variable headings are F-statistics for joint significance of nonleveraged coefficients in category
^cNumbers reported after control variable headings are F-statistics for joint significance of all leveraged or all nonleveraged ownership bracket coefficients

Chapter 8

8 *Summary*

This research attempts to explain the apparent dichotomy between an increasingly common business practice and microeconomic theory. Broad-based stock ownership programs are being adopted even though the free-rider critique argues that such incentives will be ineffective. While many explanations for this dichotomy have been proffered, such as the alignment of employee and employer incentives, peer pressure and mutual monitoring, employee self-selection, and monitoring and information costs, no rigorous theory exists that unifies these explanations or suggests a specific empirical approach to the problem. This dissertation develops and tests such a theory. The theory demonstrates that, given costly and imperfect monitoring, an optimal labor contract balances the employer's and employee's relative prices for wages and shirking. When marginal monitoring costs are large, the relative value of shirking to the employee is small and employee stock ownership can overcome the free-rider problem.

The theory yields two pairs of refutable implications. First, the optimal level of individual employee ownership increases with marginal monitoring costs and decreases with firm size. Second, the change in firm value attributable to employee stock ownership incentives increases with marginal monitoring costs and the level of individual employee ownership.

Using a sample of firms that adopt Employee Stock Ownership Plans, I test this theory in three ways. The tests estimate the effect of proxies for marginal monitoring costs on 1) the likelihood of adopting an ESOP, 2) the increase in average employee ownership brought about by an ESOP, and 3) the market reaction to the announcement of the decision to adopt an ESOP. A general overview of the test results is reported in Table

15. Overall, they provide some support for the theory. But they are not conclusive due to the use of proxy variables and a lack of consistently statistically significant relationships.

The first test indirectly tests my theory by considering the effect of marginal monitoring costs on the likelihood of adopting an Employee Stock Ownership Plan. If the value of shirking forgone is positively related to marginal monitoring costs, firms with high marginal monitoring costs have more to gain by initiating stock ownership plans. Hence, firms with high marginal monitoring costs should be more likely to adopt such plans. Results from this test provide only minimal support for my theory. The likelihood of adopting an ESOP increases with just one marginal monitoring cost proxy, the change in Tobin's Q .

The second test tests the implications that the optimal level of individual employee ownership increases with marginal monitoring costs and decreases with firm size. It examines the cross-sectional variation in the average increase in employee ownership brought about by an Employee Stock Ownership Plan. The results yield considerable support for my theory. As predicted, average employee ownership increases with my proxies for marginal monitoring costs and decreases with firm size.

The third test tests the implications that the change in firm value attributable to employee stock ownership incentives increases with marginal monitoring costs and the level of individual employee ownership. It examines the cross-sectional variation in the market reaction to ESOP announcements. Support from this test is less robust. Market reaction to ESOP announcements increases with both specifications for research and development intensity but is unrelated to market-to-book ratio and Tobin's Q .

Taken together, these results suggest that the incentive effect of stock ownership, while not the primary motivating factor behind the ESOP decision, does play a role in

management's choice of the size of the ESOP adopted and in the market's reaction to the decision.

This dissertation also considers whether or not leveraged and nonleveraged ESOPs serve different clienteles. ESOPs offer sponsoring firms unique tax, financing, and control benefits. But leveraged and nonleveraged plans do not necessarily bestow these benefits equally on their sponsors. In the tests of my theory I control for both the type of ESOP adopted and ESOP tax, financing, and control effects. Doing so facilitates tests of the premise that leveraged and nonleveraged ESOPs serve different firm clienteles.

All three tests provide considerable support for this premise. The multinomial logit regression results suggest that leveraged and nonleveraged ESOPs are independent choices, with tax and defensive considerations separating the presence of leveraged from nonleveraged plans. And the joint marginal effects of factors related to the increase in average employee ownership and the market's reaction to ESOP announcements are significantly different for leveraged and nonleveraged adopters, with tax benefits separating the market's reaction to the two types of plans. These results demonstrate that failure to account for the type of ESOP adopted in cross-sectional studies can affect inferences.

Employee Stock Ownership Plans represent only one of the many different types of broad-based stock ownership plans available. Universal stock options, employee stock purchase plans, and employee 401(k) plans that include employer stock are increasingly common. These other plans offer additional areas for testing, refining, and improving our understanding of broad-based stock incentive plans. In addition, because the model

examines changes in individual behavior, its implications are directly applicable to executive compensation that includes stock ownership.

TABLE 15, cont.: Summary of predictions and results from multinomial logit and cross-sectional regressions.

	Effect on likelihood of adoption		Effect on average increase in employee ownership		Effect on 3-day cumulative abnormal stock price returns			
	Predicted Lev	Actual Nonlev	Predicted Lev	Actual Nonlev	Predicted Lev	Nonlev	Actual Lev	Nonlev
<i>Tax variables</i>								
NOL	-	none	+	+	-	none	-**	**
Tax exposure	+	none	+, -	+	+	none	**	+
ΔTax exposure	+	none	+, -	+, -	+	none	**	-*
Debt-to-equity ratio	+	none	+	+	+	none	**	+
ΔDebt-to-equity ratio	+	none	+	+	+	none	**	+
<i>Corporate control</i>								
<i>Insider ownership segments</i>								
0-10%	-	-	+	-			n.a.	
10-25%	-	+	-*	+			n.a.	
25+%	-	-	+	+, -			n.a.	
Δ0-10%	+	-	+	-	+	+	+	-
Δ10-25%	-	+	***	-	+	+	+	-
Δ25+%	-	-	+, -	+, -	-	-	-	+
Defense	+	none	***	+	-	-	+	+
Threat	+	none	-	-	+, -	+, -	+	-
<i>Miscellaneous variables</i>								
Size		n.a.	-	-	n.a.	n.a.	+, -	-
Risk	-	none, -	***	-	-	none, -	+, -	**

***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

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Appendix 1

Relaxing the full-value tax shield assumption

When expected future earnings are less than the minimum earnings required to capture the full value of an ESOP's tax shields ($E[EBES T] < E^*$), the expected value of the tax shields decreases. Still, the expected value of the tax shields over the interval (a, b) will be greater than their expected value over the interval (a', b') if the incremental increase in value deriving from the interval (b, b') is less than the difference between the expected values for the two distributions over the interval (E_{min}, b) . The maximum value E^* can assume for this to be so is found by solving

$$\begin{aligned} \frac{\tau Es}{b' - a'}(b' - b) &= \int_{E_{min}}^{E^*} \left(\frac{\tau(x - Es)}{b - a} - \frac{\tau(x - Es)}{b' - a'} \right) dx \\ &\quad + \int_{E^*}^b \tau Es \left(\frac{1}{b - a} - \frac{1}{b' - a'} \right) dx \\ &= \tau \left(\frac{1}{b - a} - \frac{1}{b' - a'} \right) \left[\int_{E_{min}}^{E^*} x dx - Es \int_{E_{min}}^{E^*} dx + Es \int_{E^*}^b dx \right] \end{aligned}$$

Now, $(b' - a') = \delta(b - a)$, where $\delta > 1$. Then

$$\left(\frac{1}{b - a} - \frac{1}{b' - a'} \right) = \frac{1}{b - a} \left(\frac{\delta - 1}{\delta} \right).$$

Substituting these equalities and solving the integrals yields

$$\frac{\tau Es}{\delta(b - a)}(b' - b) = \frac{\tau}{(b - a)} \left(\frac{\delta - 1}{\delta} \right) \left[\frac{E^{*2} - E_{min}^2}{2} - EsE^* + EsE_{min} + Esb - EsE^* \right]$$

Simplifying yields

$$\frac{Es(b' - b)}{(\delta - 1)} = \left[\frac{E^{*2} - E_{min}^2}{2} - EsE^* + EsE_{min} + Esb - EsE^* \right]$$

$$\frac{1}{2}E^{*2} - 2EsE^* + \left[-\frac{E_{min}^2}{2} + EsE_{min} + Esb - \frac{Es(b' - b)}{(\delta - 1)} \right] = 0.$$

Solving for E^* using the quadratic formula yields

$$E^* = 2Es \pm \sqrt{4Es - 2 \left(-\frac{E_{min}^2}{2} + EsE_{min} + Esb - \frac{Es(b' - b)}{(\delta - 1)} \right)}$$

While it is not obvious that E^* may be greater than the expected value from this equation, a numerical example illustrates this result. Let $a = -8$, $b = 16$, $Es = E_{min} = 4$, and $\delta = 1.25$. Then the maximum value for E^* is 12, while the expected value of the tax shields, $E[EBEsT]$ is 4. So while the assumption that $E^* < E[EBEsT]$ may be stronger than necessary, there is, in this case at least, ample room for error.

Appendix 2

*Mathematical derivations**A. The worker's maximization problem before stock ownership*

The employee faces the constrained maximization problem:

$$\underset{\{OTJ, \mathcal{E}\}}{\text{Max}} U(P(E[NP]), g(NP)) \quad (2A.1)$$

subject to

$$P = MMRP - E[NP] - M(E[NP]) \quad (2A.2)$$

where

$$\begin{aligned} E[NP] &= OTJ + E(\mathcal{E}) \text{ and} \\ g(NP) &= OTJ + \lambda(\mathcal{E})\mathcal{E} \end{aligned} \quad (2A.3)$$

After internalizing the constraint the first order conditions are

$$\begin{aligned} \frac{\partial U}{\partial P} \frac{\partial P(E[NP])}{\partial OTJ} + \frac{\partial U}{\partial g(NP)} \frac{\partial g(NP)}{\partial OTJ} &= 0 \\ \frac{\partial U}{\partial P} \frac{\partial P(E[NP])}{\partial \mathcal{E}} + \frac{\partial U}{\partial g(NP)} \frac{\partial g(NP)}{\partial \mathcal{E}} &= 0 \end{aligned} \quad (2A.4)$$

Now

$$\begin{aligned} \frac{\partial P(E[NP])}{\partial OTJ} &= \frac{\partial}{\partial OTJ} (MMRP - E[NP] - M(E[NP])) \\ &= - \frac{\partial E[NP]}{\partial OTJ} - \frac{\partial M(E[NP])}{\partial E[NP]} \frac{\partial E[NP]}{\partial OTJ} \\ &= -1 - \frac{\partial M(E[NP])}{\partial E[NP]} \end{aligned} \quad (2A.5)$$

$$\begin{aligned} \frac{\partial P(E[NP])}{\partial \mathcal{E}} &= \frac{\partial}{\partial \mathcal{E}} (MMRP - E[NP] - M(E[NP])) \\ &= \frac{\partial E[NP]}{\partial \mathcal{E}} - \frac{\partial M(E[NP])}{\partial E[NP]} \frac{\partial E[NP]}{\partial \mathcal{E}} \\ &= 0 \end{aligned} \quad (2A.6)$$

$$\begin{aligned}\frac{\partial g(NP)}{\partial OTJ} &= 1, \text{ and} \\ \frac{\partial g(NP)}{\partial \mathcal{E}} &= \frac{\partial \lambda}{\partial \mathcal{E}} \mathcal{E} + \lambda\end{aligned}\tag{2A.7}$$

The result for equation (2A.5) is because OTJ is, by definition, known. The result for equation (2A.6) is because shirking is the employee's decision and independent of owner expectations other than through self-selection.

Substituting these values into the first order conditions yields

$$\begin{aligned}\frac{\partial U}{\partial P} \left(-1 - \frac{\partial M(E[NP])}{\partial E[NP]} \right) + \frac{\partial U}{\partial g(NP)} &= 0 \\ \frac{\partial U}{\partial g(NP)} \left(\frac{\partial \lambda}{\partial \mathcal{E}} \mathcal{E} + \lambda \right) &= 0\end{aligned}\tag{2A.8}$$

B. The worker's maximization problem after stock ownership

The employee faces the constrained maximization problem:

$$\underset{\{OTJ, \mathcal{E}\}}{\text{Max}} U(P(E[NP]), g(NP))\tag{2B.1}$$

subject to

$$P(E[NP], \mathcal{E}) = MMRP - E[NP] - M(E[NP]) - \Delta W + \alpha V(\mathcal{E})\tag{2B.2}$$

where

$$\begin{aligned}E[NP] &= OTJ + E(\mathcal{E}) \text{ and} \\ g(NP) &= OTJ + \lambda(\mathcal{E})\mathcal{E}\end{aligned}\tag{2B.3}$$

After internalizing the constraint the first order conditions are

$$\begin{aligned}\frac{\partial U}{\partial P} \left(-1 - \frac{\partial M(E[NP])}{\partial E[NP]} \right) + \frac{\partial U}{\partial g(NP)} &= 0 \\ \frac{\partial U}{\partial P} \frac{\alpha \partial V(\mathcal{E})}{\partial \mathcal{E}} + \frac{\partial U}{\partial g(NP)} \left(\frac{\partial \lambda}{\partial \mathcal{E}} \mathcal{E} + \lambda \right) &= 0\end{aligned}\tag{2B.4}$$

Solving for the optimal values of \mathcal{E} and OTJ and rearranging terms yields

$$\left(-1 - \frac{\partial M}{\partial NP^*}\right) \equiv -\frac{\frac{\partial U}{\partial g(NP)}}{\frac{\partial U}{\partial P}} \quad (2B.5)$$

$$\frac{\frac{\alpha \partial V(\mathcal{E})}{\partial \mathcal{E}}}{\left(\frac{\partial \lambda(\mathcal{E}^s)}{\partial \mathcal{E}} \mathcal{E}^s + \lambda(\mathcal{E}^s)\right)} \equiv -\frac{\frac{\partial U}{\partial g(NP)}}{\frac{\partial U}{\partial P}}$$

Equating the left-hand sides and rearranging terms yields the identity

$$\left(\frac{\partial \lambda(\mathcal{E}^s)}{\partial \mathcal{E}} \mathcal{E}^s + \lambda(\mathcal{E}^s)\right) = \frac{\frac{\alpha \partial V(\mathcal{E})}{\partial \mathcal{E}}}{\left(-1 - \frac{\partial M}{\partial NP^*}\right)} \quad (2B.6)$$

C. First order Taylor series expansion

Shirking forgone, $\Delta \mathcal{E}$, can be extracted from

$$\left(\frac{\partial \lambda(\mathcal{E}^* - \Delta \mathcal{E})}{\partial \mathcal{E}} (\mathcal{E}^* - \Delta \mathcal{E}) + \lambda(\mathcal{E}^* - \Delta \mathcal{E})\right) \quad (2C.1)$$

using a first order Taylor series expansion, as follows.

Expanding $\frac{d\lambda(\mathcal{E}^* - \Delta \mathcal{E})}{d\mathcal{E}}$ yields

$$\frac{d\lambda(\mathcal{E}^* - \Delta \mathcal{E})}{d\mathcal{E}} \approx \frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} - \Delta \mathcal{E} \frac{d^2\lambda(\mathcal{E}^*)}{d\mathcal{E}^2} \quad (2C.2)$$

Expanding $\lambda(\mathcal{E}^* - \Delta \mathcal{E})$ yields

$$\lambda(\mathcal{E}^* - \Delta \mathcal{E}) \approx \lambda(\mathcal{E}^*) - \Delta \mathcal{E} \frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} \quad (2C.3)$$

Substituting (C.2) and (C.3) into (C.1) yields

$$\begin{aligned}
& \left(\frac{\partial \lambda(\mathcal{E}^* - \Delta \mathcal{E})}{\partial \mathcal{E}} (\mathcal{E}^* - \Delta \mathcal{E}) + \lambda(\mathcal{E}^* - \Delta \mathcal{E}) \right) \\
& \approx \left(\frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} - \Delta \mathcal{E} \frac{d^2\lambda(\mathcal{E}^*)}{d\mathcal{E}^2} \right) (\mathcal{E}^* - \Delta \mathcal{E}) + \lambda(\mathcal{E}^*) - \Delta \mathcal{E} \frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} \\
& = \frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} \mathcal{E}^* - \Delta \mathcal{E} \frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} - \Delta \mathcal{E} \frac{d^2\lambda(\mathcal{E}^*)}{d\mathcal{E}^2} \mathcal{E}^* + \Delta \mathcal{E}^2 \frac{d^2\lambda(\mathcal{E}^*)}{d\mathcal{E}^2} + \lambda(\mathcal{E}^*) - \Delta \mathcal{E} \frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}}
\end{aligned} \tag{2C.4}$$

Noting that $\left(\frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} \mathcal{E}^* + \lambda(\mathcal{E}^*) \right) = 0$ and assuming the second order term $\Delta \mathcal{E}^2 \frac{d^2\lambda(\mathcal{E}^*)}{d\mathcal{E}^2}$ is approximately zero yields

$$\left(\frac{\partial \lambda(\mathcal{E}^* - \Delta \mathcal{E})}{\partial \mathcal{E}} (\mathcal{E}^* - \Delta \mathcal{E}) + \lambda(\mathcal{E}^* - \Delta \mathcal{E}) \right) \approx -\Delta \mathcal{E} \left(2 \frac{d\lambda(\mathcal{E}^*)}{d\mathcal{E}} + \frac{d^2\lambda(\mathcal{E}^*)}{d\mathcal{E}^2} \right) \tag{2C.5}$$

D. The owner-manager's short-term problem

The owner-manager faces the short-term decision

$$\underset{\{\alpha\}}{Max} (1 - N\alpha) \left(V^0 + \sum_{i=1}^N \Delta \mathcal{E}_i \right) + N\Delta W \tag{2D.1}$$

where

α = the fraction of individual employee ownership,

N = the number of employees that are partial owners,

V^0 = the value of the firm prior to employee ownership,

$\Delta \mathcal{E}_i = \frac{\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{\left(1 + \frac{\partial M}{\partial N P^*} \right) \left(2 \frac{\partial \lambda_i(\mathcal{E})}{\partial \mathcal{E}} + \frac{\partial^2 \lambda_i(\mathcal{E})}{\partial \mathcal{E}^2} \right)}, \forall i = 1, \dots, N,$ and

ΔW = the value of the compensation forgone by each worker.

The summation term can be simplified as follows.

$$\begin{aligned} \sum_{i=1}^N \Delta \mathcal{E}_i &= \frac{\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{\left(1 + \frac{\partial M}{\partial NP^*}\right)} \sum_{i=1}^N \frac{1}{\left(2 \frac{\partial \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^*} + \frac{\partial^2 \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^{*2}}\right)} \\ &= \frac{\alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}}}{\left(1 + \frac{\partial M}{\partial NP^*}\right)} \sum_{i=1}^N k_i, \quad \text{where } k_i = \frac{1}{\left(2 \frac{\partial \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^*} + \frac{\partial^2 \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^{*2}}\right)} \end{aligned} \quad (2D.2)$$

Let $\bar{k} = \frac{1}{N} \sum_{i=1}^N k_i$. Then

$$\sum_{i=1}^N \Delta \mathcal{E}_i = \frac{N \alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}{\left(1 + \frac{\partial M}{\partial NP^*}\right)} \quad (2D.3)$$

Note that $k_i < 0$ $\left(\frac{\partial \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^*} < 0 \text{ and } \frac{\partial^2 \lambda_i(\mathcal{E}, M)}{\partial \mathcal{E}^{*2}} < 0\right)$ and independent of the other terms in $\Delta \mathcal{E}_i$ (the derivatives are evaluated at a fixed point, \mathcal{E}^*) as result of the Taylor series approximation.

After substituting equation (2D.3) into (2D.1), the maximization problem can be restated as

$$\underset{\{\alpha\}}{\text{Max}} \quad (1 - N\alpha) \left(V^0 + \frac{N \alpha \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}}{\left(1 + \frac{\partial M}{\partial NP^*}\right)} \right) \quad (2D.4)$$

Differentiating with respect to, then solving for, α yields

$$\alpha = \frac{1}{2N} - \frac{V^0 \left(1 + \frac{\partial M}{\partial NP^*}\right)}{2N \frac{\partial V(\mathcal{E})}{\partial \mathcal{E}} \bar{k}} \quad (2D.5)$$

Appendix 3

Employee stock ownership when employees are risk averse

If all employees were risk neutral, marginal monitoring costs high, and employees able to affect firm value, the inclusion of employer equity in broad-based labor compensation packages would be commonplace. Still, many firms do not offer any kind of employee ownership program. This suggests that marginal monitoring costs vary widely between firms, employee behavior does not universally affect firm value or the predicted effect is small, employees are risk averse and the risk-associated costs of stock ownership are not trivial, or some combination of the three. This appendix considers the cost of risk next.

I now relax the assumption of risk-neutral employees (T.3) and assume that employees are risk averse. The expected utility that risk-averse employees derive from pecuniary compensation that includes stock will be less than the utility they receive from riskless pecuniary compensation of equal value. Owner-managers must pay employees a premium (π) for bearing stock-associated risk. If not, they will lose workers to owner-managers offering pecuniary and total compensation of equal value that does not include stock. The premium must be such that the employee's expected utility when compensation includes employer stock equal his utility when compensation does not. Then

$$E[U(W^* + (\alpha V(\mathcal{E}^*) - \Delta W + \pi))] = U(W^*) \quad (3.1)$$

where

W^* = equilibrium pecuniary compensation of fixed wages (W) only, so that $W^* = P^*$,

$$\alpha V(\mathcal{E}^*) = \Delta W .$$

$V(\mathcal{E}^*)$ = equilibrium firm value before employee stock ownership, and

π = the risk premium that equilibrates expected and known utility.

Equation (3.1) can be solved for π . Expanding the left hand side by a second order Taylor series yields

$$\begin{aligned} E[U(W^* + (\alpha V(\mathcal{E}^*) - \Delta W + \pi))] & \quad (3.2) \\ \approx E[U(W^*) + (\alpha V(\mathcal{E}^*) - \Delta W + \pi)U'(W^*) + \frac{1}{2}(\alpha V(\mathcal{E}^*) - \Delta W + \pi)^2 U''(W^*)] \\ \approx U(W^*). \end{aligned}$$

Pushing through the expectations operator

$$\begin{aligned} U(W^*) + E[\alpha V(\mathcal{E}^*) - \Delta W + \pi]U'(W^*) + \frac{1}{2}E[(\alpha V(\mathcal{E}^*) - \Delta W + \pi)^2]U''(W^*) & \quad (3.3) \\ \approx U(W^*). \end{aligned}$$

Noting that $E[Y^2] = [E(Y)]^2 + \sigma_y^2$, dividing through by $U'(W^*)$, and simplifying yields

$$\begin{aligned} E[\alpha V(\mathcal{E}^*) - \Delta W + \pi] + \frac{1}{2}[E(\alpha V(\mathcal{E}^*) - \Delta W + \pi)]^2 \frac{U''(W^*)}{U'(W^*)} + \frac{1}{2}\alpha^2 \sigma_V^2 \frac{U''(W^*)}{U'(W^*)} & \quad (3.4) \\ \approx 0. \end{aligned}$$

Let $-\frac{U''(W^*)}{U'(W^*)} = ARA$, where ARA measures an employee's degree of absolute risk aversion. Then

$$\begin{aligned} [E(\alpha V(\mathcal{E}^*) - \Delta W + \pi)]^2 \frac{ARA}{2} - E[\alpha V(\mathcal{E}^*) - \Delta W + \pi] + \alpha^2 \sigma_V^2 \frac{ARA}{2} & \quad (3.5) \\ \approx 0. \end{aligned}$$

Noting that $E[\alpha V(\mathcal{E}^*)] = \Delta W$ and using the quadratic formula to solve for $E[\alpha V(\mathcal{E}^*) - \Delta W + \pi]$ yields

$$\begin{aligned}
 \pi &\approx \frac{1 \pm \sqrt{1 - 4\left(\frac{ARA}{2}\right)\left(\alpha^2 \sigma_V^2 \frac{ARA}{2}\right)}}{2ARA} \\
 &\approx \frac{1 \pm \sqrt{1 - \alpha^2 \sigma_V^2 ARA^2}}{2ARA} \\
 &\approx \frac{1}{2} \left(\frac{1}{ARA} \pm \sqrt{\frac{1}{ARA^2} - \alpha^2 \sigma_V^2} \right) \\
 &\approx \frac{1}{2} \left(\frac{1}{ARA} - \sqrt{\frac{1}{ARA^2} - \alpha^2 \sigma_V^2} \right)
 \end{aligned} \tag{3.6}$$

The last equality follows because the premium that risk-averse employees require to bear risk increases with the amount of risk borne. The risk premium increases with the level of employee absolute risk aversion, the fraction of the firm's equity received, and the variance of the firm's stock price returns.

When employees require a risk premium, the solution to the owner-manager's maximization problem becomes considerably more complex. The fraction of the firm in the employee's compensation package feeds back into the risk premium. To keep the notation relatively simple, I consider the case of just one employee. The owner-manager's problem is

$$\underset{\{\alpha\}}{Max} (1 - \alpha)(V^0 + \Delta\mathcal{E} - \pi) + \Delta W \tag{3.7}$$

where, as before,

$$\Delta\mathcal{E} = \frac{\alpha V_{\mathcal{E}}}{k(1 + M_{NP})}.$$

The first order condition is

$$\alpha(\pi_\alpha - 2C) - V^0 + C - \pi_\alpha + \pi = 0 \quad (3.8)$$

where

$$\pi_\alpha = \frac{\partial \pi}{\partial \alpha} \quad \text{and}$$

$$C = \frac{V_\mathcal{E}}{k(1 + M_{NP^*})}$$

Solving for the optimal level of fractional ownership yields

$$\alpha^{ra} \equiv \frac{V^0 - C - \pi + \pi_\alpha}{(\pi_\alpha - 2C)} \quad (3.9)$$

The effect the risk premium has on the owner-manager's decision is found by differentiating α^{ra} with respect to π .

$$\frac{\partial \alpha^{ra}}{\partial \pi} = \frac{2C - \pi_\alpha}{(\pi_\alpha - 2C)^2 + \pi_{\alpha\alpha}(V^0 + C - \pi)} \begin{matrix} < \\ > \end{matrix} 0 \quad (3.10)$$

where

$$\pi_{\alpha\alpha} = \frac{\partial^2 \pi}{\partial \alpha^2}$$

Though the sign of equation (3.10) is indeterminate (the sign of the denominator is positive, that of the numerator ambiguous), inferences can be drawn by expanding both terms in numerator, thus.

$$\frac{2V_\mathcal{E}}{k(1 + M_{NP^*})} - \frac{\alpha\sigma_V^2}{2\left(\frac{1}{ARA^2} - \alpha^2\sigma_V^2\right)^{\frac{1}{2}}} \quad (3.11)$$

For firms with very low risk, the right hand term of (3.11) approaches zero, hence the numerator of equation (3.10) will be positive and the optimal level of employee ownership increases with the risk premium. The incentive effect of stock ownership

dominates the cost of the risk premium. But for riskier firms the right hand term will be large and the sign of the total expression will be negative. The result is that the optimal level of employee ownership decreases with the risk premium. In this case, the cost of the risk premium dominates the incentive effect of stock ownership.

The relationship between the optimal level of employee ownership and a firm's value prior to employee ownership is likewise ambiguous. Differentiating the level of employee ownership with respect to firm value yields

$$\frac{\partial \alpha^{ra}}{\partial V^0} = - \frac{2C - \pi_\alpha}{(\pi_\alpha - 2C)^2 + C(\pi_{\alpha\alpha} - 2\pi_\alpha) + \pi_\alpha^2 + \pi_{\alpha\alpha}(V^0 - \pi)} < 0 \quad (3.12)$$

The sign of the denominator is positive.³⁹ But as in equation (3.10), the sign of the numerator depends upon risk and is ambiguous. For riskier firms, the relationship is positive; for less risky firms, negative.

While the two previous relationships are ambiguous, the relationship between the optimal level of employee ownership and marginal monitoring costs is not. Differentiating the level of employee ownership with respect to the marginal monitoring costs yields

$$\frac{\partial \alpha^{ra}}{\partial M_{NP^*}} = \frac{\frac{\partial C}{\partial M_{NP^*}}(2(V^0 - \pi) + \pi_\alpha)}{(\pi_\alpha - 2C)^2 + C(\pi_{\alpha\alpha} - 2\pi_\alpha) + \pi_\alpha^2 + \pi_{\alpha\alpha}(V^0 - \pi)} < 0 \quad (3.13)$$

As in equation (3.12), the denominator is positive. But in this relationship the numerator is unambiguously negative.⁴⁰ Just as it did in a world of risk-free stock, the level of individual employee ownership increases as marginal monitoring costs increase, e.g., as the gains from monitoring near exhaustion.

³⁹This is because $\pi_{\alpha\alpha} - 2\pi_\alpha = \frac{\sigma_V^2}{2} \frac{1}{\sqrt{\lambda R \lambda^2 - \alpha_2 \sigma_V^2}} \left\{ \alpha^2 \sigma_V^2 \frac{1}{(\lambda R \lambda^2 - \alpha_2 \sigma_V^2)} + (1 - 2\alpha) \right\} > 0$ (so long as $2\alpha < 1$), and $(V^0 - \pi) > 0$.

⁴⁰This is because $\frac{\partial C}{\partial M_{NP^*}} = - \frac{V_C}{k(1 + M_{NP^*})^2} < 0$ and $(V^0 - \pi) > 0$.

Appendix 4

Fitting the Multinomial Logit Model (Maddala [1983], pp. 34-46)

Let P_l , P_n , and P_0 be the probabilities that a firm adopts a leveraged, nonleveraged, or no ESOP respectively. These probabilities can be expressed in binary form. Let

$$\frac{P_l}{P_l + P_0} = F(\beta'_l x) \quad (4.1)$$

and

$$\frac{P_n}{P_n + P_0} = F(\beta'_n x) \quad (4.2)$$

where $F(\cdot)$ is a cumulative density function. These imply

$$\frac{P_l}{P_0} = \frac{F(\beta'_l x)}{1 - F(\beta'_l x)} = G(\beta'_l x) \quad (4.3)$$

and

$$\frac{P_n}{P_0} = \frac{F(\beta'_n x)}{1 - F(\beta'_n x)} = G(\beta'_n x). \quad (4.4)$$

Because

$$\frac{P_l}{P_0} + \frac{P_n}{P_0} = \frac{1 - P_0}{P_0} = \frac{1}{P_0} - 1 \quad (4.5)$$

we have

$$P_0 = [1 + G(\beta'_l x) + G(\beta'_n x)]^{-1} \quad (4.6)$$

and hence, from (4.3), (4.4), and (4.6),

$$P_l = \frac{G(\beta'_l x)}{1 + G(\beta'_l x) + G(\beta'_n x)} \quad (4.7)$$

and

$$P_n = \frac{G(\beta'_n x)}{1 + G(\beta'_l x) + G(\beta'_n x)}. \quad (4.8)$$

Assume that the observations of ESOP types arise from a multinomial distribution with probabilities given by (4.6)-(4.8). While in theory any distribution can be assumed for the error term, the logistic is the least computationally intense. The cumulative distribution function of the logistic is

$$F(\beta'x) = \frac{1}{1 + e^{-\beta'x}}.$$

Hence, $G(\beta'_l x)$ and $G(\beta'_n x)$ equal $\exp(\beta'_l x)$ and $\exp(\beta'_n x)$. Equations (4.6)-(4.8) can be written as

$$P_j = e^{\beta'_j x} / D \quad (j = l, n)$$

and

$$P_0 = 1/D$$

where

$$D = 1 + e^{\beta'_l x} + e^{\beta'_n x}. \quad (4.9)$$

Let x_i be the vector of observations on the variables x for firm i . Then the probabilities for P_{ij} ($j = l, n, w$) for the i th firm are obtained by substituting x_i for x in equations (4.9). Also, define a set of dummy variables:

$$\begin{aligned}
 y_{ij} &= 1 && \text{if the } i\text{th firm falls in the } j\text{th category} \\
 y_{ij} &= 0 && \text{otherwise.}
 \end{aligned}$$

The likelihood function is

$$L = \prod_{i=1}^n P_{il}^{y_{il}} P_{in}^{y_{in}} P_{i0}^{y_{i0}} \quad (4.10)$$

or

$$\log L = \sum_{i=1}^n \sum_{j=l,n,0} y_{ij} \log P_{ij} \quad (4.11)$$

because

$$P_{ij} = \frac{\exp(x'_i \beta_j)}{1 + \exp(x'_i \beta_l) + \exp(x'_i \beta_n)}, \quad (j = l, n)$$

and

$$P_{i0} = \frac{1}{1 + \exp(x'_i \beta_l) + \exp(x'_i \beta_n)}.$$

After simplifying the relevant expressions,

$$\frac{\partial P_{il}}{\partial \beta_l} = \frac{e^{\beta'_l x_i} (1 + e^{\beta'_n x_i})}{(1 + e^{\beta'_l x_i} + e^{\beta'_n x_i})^2} = P_{il} (1 - P_{il}) x_i$$

$$\frac{\partial P_{in}}{\partial \beta_n} = \frac{e^{\beta'_n x_i} (1 + e^{\beta'_l x_i})}{(1 + e^{\beta'_l x_i} + e^{\beta'_n x_i})^2} = P_{in} (1 - P_{in}) x_i$$

$$\frac{\partial P_{il}}{\partial \beta_n} = \frac{\partial P_{in}}{\partial \beta_l} = - \frac{e^{\beta'_l x_i} e^{\beta'_n x_i}}{(1 + e^{\beta'_l x_i} + e^{\beta'_n x_i})^2} = - P_{il} P_{in} x_i$$

and

$$\frac{\partial P_{i0}}{\partial \beta_j} = - \frac{e^{\beta_j' x_i}}{(1 + e^{\beta_l' x} + e^{\beta_n' x})^2} = - P_{ij} P_{i0} x_i \quad (j = l, n).$$

Hence, we have

$$\begin{aligned} \frac{\partial \log L}{\partial \beta_k} &= \sum_{i=1}^n \left[\frac{y_{ik}}{P_{ik}} P_{ik} (1 - P_{ik}) + \sum_{\substack{j=l,n,0 \\ j \neq k}} \frac{y_{ij}}{P_{ij}} (-P_{ij} P_{ik}) \right] x_i & (4.12) \\ &= \sum_{i=1}^n \left[y_{ik} - P_{ik} \left(\sum_{j=l,n,0} y_{ij} \right) \right] x_i \\ &= \sum_{i=1}^n (y_{ik} - P_{ik}) x_i \end{aligned}$$

because

$$\sum_{j=l,n,0} y_{ij} = 1.$$

Thus the conditions to solve for obtaining maximum likelihood estimates are

$$\begin{aligned} \sum_{i=1}^n (y_{il} - P_{il}) x_i &= 0 & (4.13) \\ \sum_{i=1}^n (y_{in} - P_{in}) x_i &= 0 \end{aligned}$$

Equations (4.13) are nonlinear in β_l and β_n , because P_{il} and P_{in} are nonlinear functions of all the β 's. The equations can be solved by the method of scoring. Differentiating equations (4.12) again yields

$$\frac{\partial^2 \log L}{\partial \beta_k \partial \beta_k'} = - \sum_{i=1}^n P_{ik} (1 - P_{ik}) x_i x_i', \quad (k = l, n) \quad (4.14)$$

and

$$\frac{\partial^2 \log L}{\partial \beta_l \partial \beta'_n} = \sum_{i=1}^n P_{il} P_{in} x_i x'_i \quad (4.15)$$

The matrix of second derivatives is negative definite. Hence, the likelihood function has a unique maximum and the iterative procedure converges to that maximum. Starting values (β_l^0 and β_n^0) are obtained by estimating linear probability models using ordinary least squares regressions. Then

$$\begin{bmatrix} \beta_l \\ \beta_n \end{bmatrix} = \begin{bmatrix} \beta_l^0 \\ \beta_n^0 \end{bmatrix} + \begin{bmatrix} -\frac{\partial^2 \log L}{\partial \beta_l^0 \partial \beta_l^0} & \frac{\partial^2 \log L}{\partial \beta_l^0 \partial \beta_n^0} \\ \frac{\partial^2 \log L}{\partial \beta_l^0 \partial \beta_n^0} & -\frac{\partial^2 \log L}{\partial \beta_n^0 \partial \beta_n^0} \end{bmatrix}^{-1} \begin{bmatrix} \frac{\partial \log L}{\partial \beta_l^0} \\ \frac{\partial \log L}{\partial \beta_n^0} \end{bmatrix} \quad (4.16)$$

The right-hand-side product is

$$\begin{bmatrix} -\sum_{i=1}^n P_{il}(1 - P_{il}) x_i x'_i & \sum_{i=1}^n P_{il} P_{in} x_i x'_i \\ \sum_{i=1}^n P_{il} P_{in} x_i x'_i & -\sum_{i=1}^n P_{in}(1 - P_{in}) x_i x'_i \end{bmatrix}^{-1} * \begin{bmatrix} \sum_{i=1}^n (y_{il} - P_{il}) x_i \\ \sum_{i=1}^n (y_{in} - P_{in}) x_i \end{bmatrix} \quad (4.17)$$

where P_{ij} 's and y_{ij} 's are as previously defined.

APPENDIX 5

Sensitivity of regression results to inclusion of independent deflator variable

TABLE A: Sensitivity tests for regressions that use the average increase in employee ownership for the dependent variable.

Sensitivity of regression results to the inclusion of an independent deflator variable as recommended by Barth and Kallapur [1996]. The sample is comprised of 48 leveraged and 25 nonleveraged ESOP adopting firms. The dependent variable is the average increase in individual employee ownership resulting from the ESOP. The independent variables are defined as follows: market-to-book ratio is the ratio of market value to book value of equity; research and development intensity 1 is research and development expense per employee; capital intensity is gross plant, property, and equipment per employee; size is the natural log of the market value of equity. Regression (1) uses net sales as an independent deflator variable; regression (2) does not. *T*-statistics are calculated using White standard deviations.

	(1)		(2)	
	Independent deflator variable included		Independent deflator variable omitted	
	Leveraged	Nonleveraged variance	Leveraged	Nonleveraged variance
<i>Variables</i>				
<i>Employee incentives</i>				
Market-to-book ratio	2.34*** (3.40)	-2.24** (-2.55)	1.60** (2.01)	-1.75* (-1.80)
R&D Intensity 1	0.265** (2.68)	-0.0274†† (-0.27)	0.237* (1.95)	-0.0058†† (-0.05)
<i>Employee influence</i>				
Capital Intensity	0.0124*** (16.4)	-0.0114*** (-6.13)	0.0114*** (10.2)	-0.0099*** (-4.69)
<i>Miscellaneous</i>				
Size	-3.93*** (-4.98)	2.84*** (3.63)	-2.83*** (-4.82)	1.98*** (3.02)
Constant	20.1*** (4.22)	-15.0*** (-3.14)	16.3*** (4.02)	-11.6*** (-2.77)
<i>Independent deflator</i>				
Net Sales	0.0012*** (3.47)			
<i>F-statistics</i>				
Regression	10.20***		9.71***	
[<i>p</i> -value]	[0.00]		[0.00]	
All nonleveraged coefficients	7.15***		5.59***	
All nonleveraged incentive coefficients	0.90		0.50	
Adjusted- <i>R</i> ²	0.57		0.52	

TABLE B: Sensitivity tests for regressions that use 3-day cumulative abnormal returns for the dependent variable.

Sensitivity of regression results to the inclusion of an independent deflator variable as recommended by Barth and Kallapur [1996]. The sample is comprised of 48 leveraged and 25 nonleveraged ESOP adopting firms. The dependent variable is the 3-day cumulative abnormal return when an ESOP is announced, as estimated by a two-factor market model with partial anticipation. The independent variables are defined as follows: market-to-book ratio is the ratio of market value to book value of equity; research and development intensity 1 is research and development expense per employee; capital intensity is gross plant, property, and equipment per employee; NOL is a binary variable equal to one if the firm reports a net-operating-loss carryforward, else zero; tax ratio is the ratio of operating income less interest and amortization divided by operating income; debt-to-equity ratio is the ratio of the book value of debt to the market value of equity; insider ownership is the percentage of beneficial ownership by board and management; change in insider ownership is the change in insider ownership segments engendered by adopting an ESOP; defense is a binary variable equal to 1 if the firm initiates an anti-takeover tactic during the two years prior to adopting an ESOP, else zero; threat is a binary variable equal to 1 if the firm is the subject of takeover threats or rumors during the two years prior to adopting an ESOP, else zero; size is the natural log of the market value of equity; beta and root mean squared error are estimated parameters from the two factor market model; and repurchase plan is a binary variable equal to one if a stock repurchase plan is announced simultaneously with the decision to adopt an ESOP. All observations are for the year ending just prior to the year in which an ESOP decision is announced. *T*-statistics calculated using White standard deviations are reported in parentheses.

<i>Model specification</i>	Insider ownership: 3 segments Independent deflator: Yes	Insider ownership: 1 total Independent deflator: Yes	Insider ownership: 3 segments Independent deflator: No	Insider ownership: 1 total Independent deflator: No
<i>Variables</i>				
<i>Employee incentives</i>				
Market to book	-0.0059 (-0.87)	0.000596 (0.08)	-0.0013 (-0.52)	0.00575 (0.83)
R&D intensity 1	0.00214** (2.46)	0.00242** (2.65)	0.00219** (2.55)	0.00251*** (2.73)
<i>Employee ownership</i>				
Average percentage of employee ownership	0.00162 (1.24)	0.00076 (0.72)	0.00121 (1.08)	0.00046 (0.48)
<i>Employee influence</i>				
Capital intensity	-0.00003 (-1.28)	-0.000017 (-0.79)	-0.00002 (-0.87)	-0.000004 (-0.20)

TABLE B, cont.: Sensitivity tests for regressions that use 3-day cumulative abnormal returns for the dependent variable.

<i>Model specification</i>	Insider ownership: 3 segments Independent deflator: Yes	Insider ownership: total Independent deflator: Yes	Insider ownership: 3 segments Independent deflator: No	Insider ownership: total Independent deflator: No
<i>Tax incentives</i>				
NOL	0.00254 (0.14)	0.00807 (0.48)	-0.0018 (-0.10)	0.00465 (0.28)
Tax ratio	-0.0056 (-0.32)	-0.00530 (-0.32)	-0.0059 (-0.33)	-0.0055 (-0.33)
Debt to equity	0.0155 (0.83)	0.0151 (0.81)	0.0127 (0.69)	0.0115 (0.63)
<i>Corporate control</i>				
Insider ownership		-0.00043* (-1.85)		-0.00052** (-2.14)
Change in 0-10% ownership	0.00197 (1.20)		0.00283* (1.87)	
Change in 10-25% ownership	0.00051 (0.29)		0.00087 (0.52)	
Change in 25+% ownership	-0.0027* (-1.70)		-0.0026 (-1.66)	
Defense	0.00886 (0.64)	0.00847 (0.61)	0.00828 (0.59)	0.00792 (0.56)
Threat	0.0193 (1.40)	0.0192 (1.34)	0.0237* (1.73)	0.0240* (1.67)

TABLE B, cont.: Sensitivity tests for regressions that use 3-day cumulative abnormal returns for the dependent variable.

<i>Model specification</i>	Insider ownership: 3 segments Independent deflator: Yes	Insider ownership: 1 total Independent deflator: Yes	Insider ownership: 3 segments Independent deflator: No	Insider ownership: 1 total Independent deflator: No
<i>Miscellaneous</i>				
Size	0.0024 (0.31)	-0.00085 (-0.11)	-0.0051 (-0.96)	-0.0083 (-1.42)
Beta	-0.0293* (-1.96)	-0.0237* (-1.86)	-0.0294* (-1.98)	-0.0250* (-1.93)
Root mean squared error	0.238 (0.34)	-0.157 (-0.25)	0.0993 (0.14)	-0.274 (-0.43)
Repurchase plan	0.0195* (1.83)	0.0239** (2.22)	0.0180* (1.72)	0.0222** (2.08)
<i>Independent deflator</i>				
Net sales	-0.000007* (-1.82)	-0.000007** (-2.00)		
Constant	0.00676 (0.17)	0.0266 (0.60)	0.0378 (1.18)	0.0612 (1.65)
F-statistic (p-value)	1.17 (0.32)	1.32 (0.22)	1.18 (0.31)	1.33 (0.22)
Adjusted-R ²	0.04	0.06	0.04	0.06

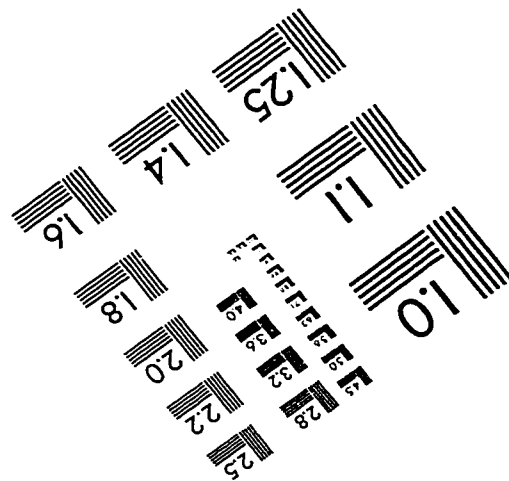
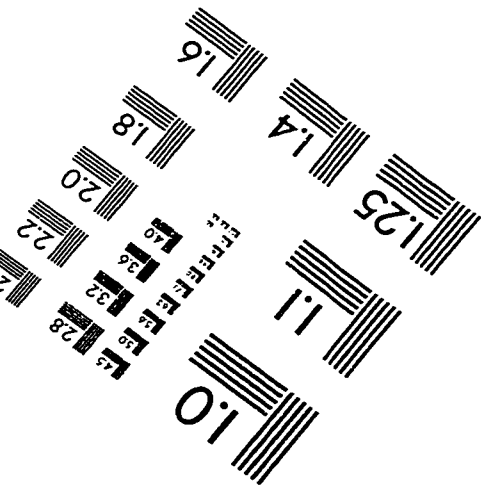
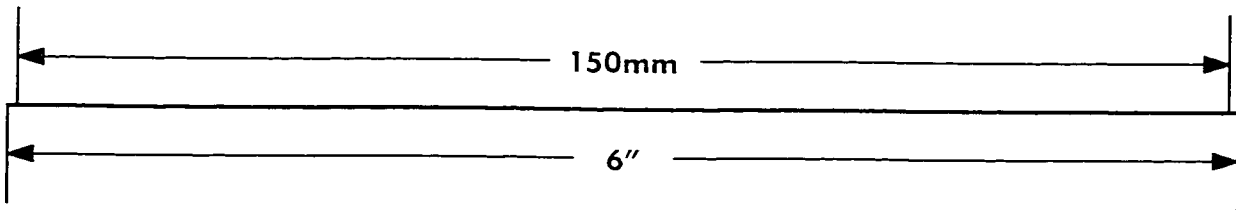
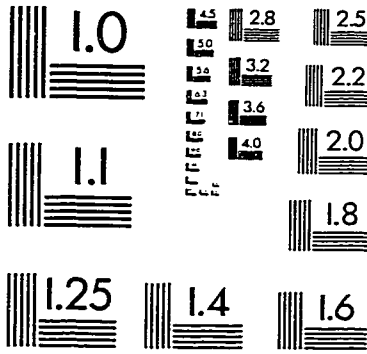
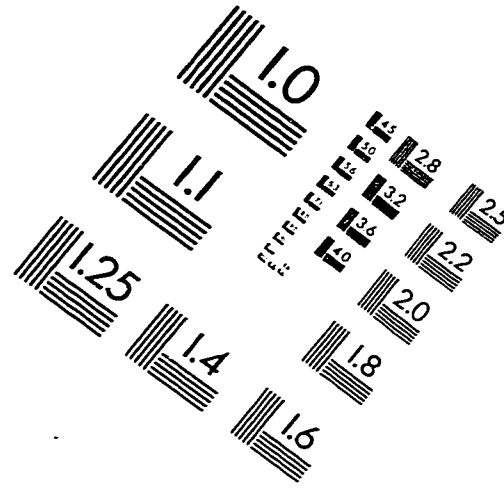
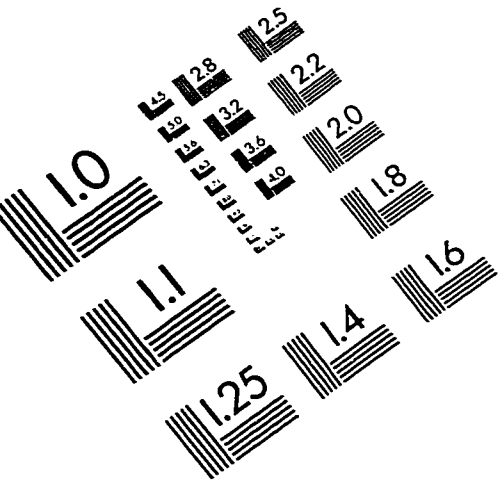
***, **, * Significant at the 0.01, 0.05, or 0.10 level of confidence, respectively

†† Net effect significant at the 0.05 level of confidence

VITA

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