INTELLECTUAL CAPITAL, MONITORING AND RISK:

WHAT PREDICTS THE ADOPTION OF BROAD-BASED EMPLOYEE STOCK OPTIONS?

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Abstract

In this paper, we use empirical analysis to analyze company characteristics associated with the adoption and maintenance of broad-based stock option plans. First, a cross-sectional analysis evaluates what company characteristics are now associated with these plans. Second, a longitudinal analysis examines the company characteristics that predict the adoption of such plans. Overall, our results provide support to the claim that higher monitoring costs prompt firms to adopt and maintain employee stock option plans. Firms with higher levels of business risk are less likely to shift some of that risk to employees through stock-based compensation, whereas firm with higher variability in total shareholder returns are more likely to adopt broad-based employee stock options. Nonunion firms are more likely to adopt and maintain such plans, and financial constraints do not appear to be driving the adoption decision.

Introduction

Stock options have long been associated with the executive level, however, over the last ten years they have increasingly become associated with lower levels of management and employees. In the U.S., approximately 10,000,000 employees have received stock options which is more employees then in either ESOPs, 401k plan or any other form of stock-based compensation plans (NCEO, 2002). Broad-based stock option grants in large S&P 500 companies increased by 50 percent between 1990 and 1998 (Weisbenner, 2000), while the value of stock option grants per employee increased by a factor of four between 1994 and 1998 (Liang and Sharpe, 1999). In the wake of recent high profile corporate scandals (e.g. Enron, Tyco, Worldcom etc.), both executive and employee stock options are under substantial public and legislative scrutiny[1]. Unlike other types of employee compensation, current accounting practices do not require stock options to be expensed in financial statements. They are, however, treated as an expense for tax purposes, generating a corporate tax deduction. This favorable accounting and tax treatment may result in inflated earnings[2], which has raised concern that many companies adopt broad-based stock option plans to give an artificial boost to their earnings, rather than for sound business reasons.

In order to develop informed public policies about employee stock options, it is important to understand what factors drive a company's decision to adopt a broad-based stock option plan[3]. There is very little theoretical or empirical work on this topic. In this paper, we derive and test predictions from management and economic theories about the adoption of broad-based stock options. Using an agency theory perspective, we hypothesize

that firms which rely heavily on 'difficult to monitor' inputs from human capital will be more likely to adopt compensation plans that provide inexpensive substitutes for more formal monitoring (e.g. hiring more managers or supervisors). Monitoring problems are likely to be more severe in knowledge-based firms where intellectual capital is the main source of customer value, in large firms, or in firms that are experiencing fast growth. Theory suggests that risk-sharing and financial constraints may also encourage the adoption of broad-based employee stock options. In this paper, we use empirical analysis to analyze company characteristics associated with the adoption and maintenance of broad-based stock option plans. First, a cross-sectional analysis evaluates what company characteristics are now associated with these plans. Second, a longitudinal analysis examines the company characteristics that predict the adoption of such plans. We use data through 1999 but exclude data from subsequent years because adoption decisions in our data-set were all made prior to the market downturn in 2000. We speculate that firms that adopt after 2000 would be using a much different decision framework and one we are not able to test with our data.

Theory and Existing Research

Employee behaviors do not always promote organizational goals. Employees may choose to shirk, steal, misrepresent their abilities, etc. in order to maximize their personal utilities. Faced with these 'moral hazard' and 'adverse selection' problems, firm owners put in place control mechanisms that will guide employee behavior in the right direction. Agency theory (Eisenhardt, 1988, 1989; Jensen & Meckling, 1976) deals with the problem of creating

alignment between the interests of owners and their agents by using appropriate control and incentive mechanisms[4] (Jensen & Meckling, 1976; Bloom & Milkovich, 1998). Owners must choose the right mix of behavior control (monitoring) and output control (incentive compensation). In contexts where monitoring is difficult, firms can choose to put in place compensation systems that align the interests of owners and employees (Eisenhardt, 1989). Pay systems such as profit-sharing and stock-based compensation can, in theory, align the interests of these two parties and may provide a cost effective substitute or complement to formal monitors (Asch and Warner, 1997; Kruse, 1993). Therefore, one would expect that firms that face high monitoring costs will be more likely to adopt a broad-based stock option plan.

Monitoring Costs. While there are no direct measures of monitoring costs firm characteristics are associated with high monitoring costs. High growth makes control, coordination, and monitoring more difficult (Smith & Watts, 1992). High levels of intangibles such as intellectual capital (e.g. new knowledge generation, superior marketing, customer loyalty, etc.) will also increase monitoring costs (Bell and Kruse, 1995; Kang and Sørensen, 1999). Specifically, firms that invest large amounts of money in research and development pose a monitoring problem for their owners, as it may be very difficult for the latter to assess the quality and quantity of the work being done. Consequently, in firms with high levels of intellectual capital, it may be appropriate to leave it to the stock market to make that assessment, and reward employees, at least partially, with market-based incentives.

Monitoring costs also increase with the use of sophisticated and expensive machinery

(Bell and Kruse, 1995). Cooperation among employees and between employees and management becomes more important because the production process is increasingly a function of team-based complementary work practices (Milgrom and Roberts, 1992). Large firms may have more severe monitoring problems compared to small firms, as it is difficult to observe the level of effort of each individual employee. Individual incentive plans do not provide the best solution to reducing monitoring costs in these firms, because they encourage competition among employees, and a narrow focus on one's own performance (Cooke, 1994). Group incentive plans may be a better alternative, as such plans can encourage cooperative behaviors and mutual monitoring (Weitzman and Kruse, 1990). Some scholars have argued that group incentives such as broad-based stock options may not work well in large firms, because of the higher potential for free-riding behavior (Gerhart, 2000). However, game theory suggests that in the context of a long-term employment relationship, when multiple rounds of performance and reward distribution are experienced by a group of employees, the group incentive plan may defeat the free rider problem(Weitzman and Kruse, 1990). Therefore, large firms may be more likely to adopt group incentive plans such as broad-based stock options.

Risk. Compared to a fixed salary contract, incentive pay shifts some of the risk associated with owning a business to employees. Agency theorists suggest that it is efficient to transfer risk to employees through incentive compensation when monitoring costs are high, and employees have control over performance outcomes. However, a risk premium needs to be included to adjust total compensation for the increased level of risk. There is extensive literature on the fit

between CEO compensation and firm risk (Aggarwal & Samwick, 1999; Beatty & Zajac, 1994; Bloom & Milkovich 1998; Gray & Cannella, 1997; Miller, Wiseman, & Gomez-Mejia, 2002). This literature suggests that there is an inverse relationship between the level of firm risk and the degree to which incentive compensation for top managers is used, with some studies finding a curvilinear relationship between risk and CEO compensation (Miller, Wiseman, & Gomez-Mejia, 2002). Whether such a pattern holds for firm-wide incentive pay that represents a relatively small percentage of an individual's total pay is an open question that we address in our empirical analysis.

Financial Constraints. In addition to their desire to reduce monitoring costs, firms may be driven to adopt broad-based stock option plans because of financial constraints. Smaller and/or faster growing firms may face higher costs of capital (Core & Guay, 2000; Ittner, Lambert, & Larcker, 2001) due to already high debt burdens, low liquidity, or because investors perceive the business prospects of such firms as risky. Under these circumstances, employee stock options can help preserve the cash needed to sustain growth, assuming they are used as a substitute for other forms of compensation such as cash bonuses or above-average base compensation. Current accounting rules allow U.S. companies to not deduct the cost of stock options grants from the income reported to shareholders (as they would be required to do if they used other forms of incentives such as bonuses or profit sharing), yet companies can deduct the cost of options from their taxable income, calculated as the difference between the grant price and the exercise price, if and when the options are exercised (McLean, 2000).

Union Status. Many unions in the 1990s have adopted a proactive, cooperative approach to the employment relationship by supporting high-performance workplace practices and initiatives that enhance employee involvement and commitment (Masters & Atkin, 1999). Recent research on group incentive plans such as profit sharing, employee ownership and stock sharing plans indicates that unions support the use of these forms of compensation, and union presence is a significant predictor of the adoption of such plans (Kruse, 1993; McElrath & Rowen, 1992; Heneman, von Hippel, Eskew and Greenberg, 1997). As unions have tried to organize employees in high-technology industries such as telecommunications, they have requested that stock options be granted to union members (Romero, 2000). However, some employers may adopt incentives such as profit-sharing or stock-based compensation plans to discourage unionization, as ownership is expected to align the interests of worker, management, and outside shareholders (Kruse, 1996). Therefore, it is difficult to predict the direction of the association between union status and the adoption and maintenance of a broad-based stock option plan.

Ownership Culture. Employee stock options may be used to instill and support a culture of accountability and entrepreneurship. By shifting some of the business risk to employees through stock options, owners may be able to more easily drive home the message that the ultimate goal of employee effort is creating customer and shareholder value (Kroll, 1997). Other potential goals that can be facilitated by group incentives such as broad-based stock options include promoting teamwork and trust across individuals, departments, and business units (Applebaum and Berg, 2000; Rousseau and Shperling, 2000). Such group incentive

plans may also be adopted to create an egalitarian work environment, assisting to promote the cooperative behaviors necessary for team production (FitzRoy and Kraft, 1987; Weitzman and Kruse, 1990; Kruse & Blasi, 1997). Unfortunately, it is difficult to test these propositions empirically, as such a test would require detailed firm-level data on business strategy and management practices.

Related Research. There is little empirical research focusing on what factors predict the use of broad-based stock option plans. There is, however, a more substantial body of literature associated with the adoption of other forms of equity compensation (Kruse, 1996; Sesil, Kruse & Blasi, 2001). There is some evidence that firms that are more likely to incur high degrees of monitoring costs may be more likely to adopt equity ownership (Patibandla & Chandra, 1998). It appears that large firms are more likely to adopt employee stock ownership plans, suggesting that there may be high fixed costs associated with the administration of such plans (Blair, Kruse & Blasi, 2000). There is also some evidence that higher variability in company profits is associated with the adoption of employee ownership plans (Sesil, et.al., 2001). This may indicate the desire to achieve some compensation flexibility because this form of pay can increase or decrease compensation without changing fixed compensation costs.

Existing empirical research on employee stock option plans by Core and Guay (2000) found that firms use greater levels of stock option compensation when facing capital requirements and financing constraints. Ittner et al. (2001) also examined determinants of employee stock option compensation, and found that growth opportunities, firm size, and cash availability are associated with high levels of option compensation. Both of these studies use

stock option grant magnitude as a dependent variable, and draw their data on employee stock option grant existence and magnitude from 10-K financial statements. Also, both studies focus on financial factors as predictors of levels of stock option grants, and exclude from the analysis firms *without* broad-based employee stock options. This approach provides insights into the grant-level determining factors that operate within stock-option companies, but does not directly address the question of why companies adopt such plans in the first place, and how adopters differ from non-adopters. Our paper extends prior research by addressing these two questions.

Methods and Data

We used a database on stock-option plans in publicly owned U.S. companies provided by the National Center for Employee Ownership (NCEO) in 1998, as well as data from two recent surveys conducted by the NCEO in 1998 and 2000 (Weeden, Carberry, and Rodrick, 1998; Weeden, Rosen, Carberry, & Rodrick, 2001) for descriptive statistics on the two surveys). The NCEO database identified a total of approximately 600 public and private companies sponsoring some form of a broad-based stock option plan, based on published information and data provided from consulting companies. We merged the NCEO database of 600 companies with COMPUSTAT data on publicly owned companies (using the1999 full coverage files). COMPUSTAT listed 453 out of the 600 companies sponsoring broad-based stock option plans. These are the stock option companies used in our cross-sectional analysis (Model 1).

For a subset of 141 of these 453 companies, we were able to identify the year when the

broad-based stock option plan was introduced. We obtained this information from the two NCEO surveys mentioned above. We used the start dates to examine what company characteristics predict the adoption of a stock option plan (see Model 2). However, only 57 of the 141 firms had data on all variables needed to estimate the model, as many of the companies were relatively young and had adopted their plans recently, so there was no pre-adoption data available on them.

We use a cross-sectional logit[5] model to examine the characteristics of firms maintaining broad based stock option plans in 1999. The model is:

$$(1) \qquad P(SO_i = 1 \mid X_i) = F(\alpha + \beta_i * X_i)$$

Where SO is a dummy variable indicating the existence of a broad based stock option plan in 1999, F stands for logit, *b* is a coefficient vector, and *X* is a vector of explanatory variables described in Table 1.

Insert Table 1 about here

Monitoring. To capture the difficulty (or ease) of monitoring we used the following independent variables. Past Growth: the average growth rate of sales, for each firm with at least two years of sales data over the 1980-1999 period. Expected Growth: 3-year average of the market-to-book ratio. Traditionally, the market-to-book ratio has been interpreted as an indicator of investor expectations about earning a return on their investment in excess of the fair market rate (Bodie, Kane, and Marcus, 1989). That is, the greater the expected profitability of the firm's future investment opportunities, the greater its market-to-book ratio[6].

Intellectual Capital: Typically, the market-to-book ratio has also been interpreted as an aggregate indicator of intellectual capital (Dzinkowski, 2000; Moore, 1996). In essence, the argument for using the market-to-book ratio as a measure of intellectual capital is that investor expectations about superior future profitability are contingent on the firm's intangible assets that are not reflected in financial statements: human capital, customer capital, and organizational capital (Dzinkowski, 2000). To supplement this aggregate measure of intellectual capital, we also use a more traditional measure: expenses on R&D (scaled by total assets, 3-year average). Capital Intensity: it is measured as the 3-year average of the natural logarithm of book value of property, plant, and equipment per employee. Size: the natural logarithm of the 3-year average of the number of firm employment was used.

Risk. We used two variables as proxies for variable product/service markets and capital markets, the Standard Deviation of Annual Sales and the Standard Deviation of Total Shareholder Returns (over the entire 'Compustat life' of the firm, for each firm with at least two years of data).

Financial Constraints. We used two Cost of Capital measures, the 3-year average ratio of long-term debt to invested capital (the firm's debt burden), and the 3-year average ratio of interest payments to operating income (the firm's interest burden). We also used two Liquidity and Profitability measures, the 3-year average of cash as a percent of total assets, and the 3-year average of net profit margins.

Union Status. COMPUSTAT does not provide information on unionization; we used data from IRS's Form 5500 database to establish union status. A company was categorized as having a union if at least one of its retirement plans was subject to collective bargaining. Ten industry dummies were included as control variables (see Table 3 for the industry distribution of the data).

Model (1) is a cross-sectional specification, and it reflects both the causes and effects of adoption. In Model (2), we estimate the probability of adopting a broad-based stock option plan as a function of pre-adoption levels and growth in the independent variables. The model is:

$$(2) \qquad P(SO_{it} = 1 \mid X_{it}) = G(\alpha + \beta_i * X_{it})$$

Where SO is a dummy variable indicating that a firm adopted a broad based stock option plan in year t. *G* stands for the population-averaged logit model, *b* is a vector of coefficients, and *X* is a vector of explanatory variables described in Table 1.

The data for model (2) is restricted to firms which did not have a stock option plan in year t-1. Firms that have an employee stock option plan, but for which we did not have a start date for the plan, were excluded from the analysis. The time-frame studied is 1990-1999. Lagged levels of the predictors are used to avoid simultaneity problems. The logit specification was chosen because it yields more consistent estimators with panel data (Hsiao 1986: 163). An AR(1) correction was done to adjust for autocorrelation.

The variables in model (2) are the same as the ones used for model (1); the only difference is that t-1 levels are used for all variables (see Table 1).

Results and Discussion

Descriptive statistics are summarized in Table 2 and Table 3. Table 2 reports the percent of firms in each industry[7] that sponsored a broad-based stock option plan for the entire COMPUSTAT population of firms in 1999 (9,907 firms of which 5%, or 453 firms, sponsored broad-based stock option plans).

Insert Table 2 about here

The highest incidence within industry, 9% of all companies in the sector, is found in two of the manufacturing sectors, 'Metal, fabricated metal, machinery' (computer manufacturers fall within this category), and 'Other manufacturing' (medical and other precision instruments, microchips, etc.). Also, 6% of companies in the 'Lumber, paper, printing' sector (where publishing companies are classified), and 6% of 'Service' sector companies (software, consulting, etc.) grant broad based stock option. Table 2 also reports employment-weighted data in order to assess the percent of employees within each industry (rather than the percent of firms) that are exposed to broad-based stock options. Thus, 1.6 million (or 9%) of the total of 17.8 million employees in the COMPUSTAT population work in companies that offer broad based stock option plans. The employment-weighted percentages are higher than the equally weighted percentages reported in the first column suggesting that public companies that offer such plans tend to be relatively large.

Insert Table 3 about here

Table 3 reports descriptive statistics for Model (1). Data on all variables necessary to estimate the model was available on 4,081 companies from all private industry sectors (except agriculture, mining, and construction). Seven percent (295) of these 4,081 companies maintained a stock option plan in 1999.

Insert Table 4 about here

Table 4 presents the results for Model (1). With respects to monitoring costs, this model asks the question: are firms with higher monitoring costs more likely to have a broad-based stock option plan? Two of the monitoring costs indicators, past growth and firm size are not significant predictors of plan existence. The indicators for expected future growth/profitability, intellectual capital, and capital intensity show a strong and significant positive association with the presence of a broad-based stock option plan. More specifically, the model estimates that the average company has a 6.7% probability of having a broad based stock option plan. When the natural log of the market-to-book ratio increases by one unit from its average value (which amounts to approximately doubling the market-to-book ratio), the probability of having a broad-based stock option plan increases by 3.9%, for a combined total of 10.6%. The marginal effects for investment in R&D and capital intensity are 1.4% and 1.7% respectively. These results provide support for a monitoring costs explanation, with an emphasis on expected growth, intellectual capital and capital intensity.

Regarding risk, we find that a high variance in sales over time is predictive of the existence of a broad-based stock option plan. Our second measure of risk, the variability of total shareholder return, was negatively correlated with the variability of sales (r = -0.27), thus

making it difficult to interpret unambiguously the respective coefficients for these two variables[8]. Our results suggest that companies that experience more dramatic changes in their product/service and financial markets from year to year are more likely to have a company-wide stock-based incentive plans. This finding opens up interesting questions about the total compensation structure in these companies, that is are employees receiving a risk premium of some kind (e.g. higher base wages, higher bonuses, more generous option grants, etc.). It also calls for better understanding of employee perceptions of the risks associated with stock-based compensation.

We find no cross-sectional evidence that constraints associated with the cost of capital and liquidity predict the presence of an employee stock option plan. On the contrary, it would appear that current capital and liquidity constraints decrease the probability of having a broad-based stock option plan. Specifically, higher interest burdens decrease the probability of having a broad-based stock option plan, whereas higher liquidity increases it. The debt burden is not a significant predictor. The cross sectional data makes it difficult to disentangle the causes for adopting stock option plans from their effects. It may be the case that firms facing high costs of capital because of a high debt burden adopt broad-based stock options as a source of capital and as a cash-saving device. Perhaps after adopting stock option plans, such firms are able to preserve their cash and rely less on outside funding, which would account for the observed pattern in the cross-sectional results. Keeping a higher proportion of their assets in cash may allow stock option firms to finance future growth by acquiring other firms in order to gain access to new technologies and customer bases. Lower interest burdens and higher liquidity are indicators of financial health, and are both significant predictors of the

presence of a broad-based stock option plan. But the results for the other indicator of financial health used, profitability, are in the opposite direction. An increase of one point in the natural logarithm of the average profit margin is associated with a 0.6% decrease in the probability of maintaining a stock option plan (Table 4), controlling for size and industry. To some extent, this finding may reflect the fact that companies with employee stock option plans tend to have higher expected growth (as indicated by the results for the market-to-book ratio), which may cause them to have high current expenditures, and lower profit margins. In fact, in the 1990s, many 'New Economy' companies tended to enjoy high market valuations without having a demonstrated record of profits and earnings, reflecting shareholder expectations for future profitability.

Union firms were found to be much less likely to have stock option plans. The average union company has a 2.2% chance of having such a plan, compared to the base probability of 6.7% for all companies (see Table 4). This cross-sectional finding may reflect both a 'supply' and 'demand' problem. On the 'supply' side, employers may be unwilling to offer union employees stock options. For example, in the 90ies, Pepsico has explicitly excluded union workers from its broad-based stock option plan, in an effort to weaken unions[9]. On the 'demand' side, unions may distrust variable compensation such as profit-sharing or stock options because it has been used by some employers as an antiunion tool, and because it may increase the variability of worker income, thus creating income inequality among workers and worker competition among firms, which makes unionization more difficult (Kruse, 1993). Some unions may not be too keen on having employees become owners, as this would diminish the need for rules, procedures, and an intermediary between worker-owners,

manager-owners, and outside shareholders. That union companies are less likely to have and adopt a stock option plan for employees is unfortunate, considering that the empirical evidence on group incentives such as profit-sharing (Kruse, 1993; Cooke, 1994) and broad-based stock options (Kroumova, Sesil, Kruse, & Blasi, 2002) suggests that both union and nonunion companies can show positive productivity differentials associated with such plans. Therefore, both employers and unions could potentially benefit from cooperating to implement such group incentive plans.

To summarize, the cross-sectional results described above provide fairly strong support for the conjecture that firms opt to have a broad based stock option plan because of monitoring cost and risk considerations. The results also show that current financial constraints are not associated with the presence of a broad-based stock option plan, perhaps suggesting that over time, liquidity, debt burdens and interest burdens improve in companies that adopt such plans. Also, union companies are less likely to have employee stock option plans.

Insert Table 5 about here

Table 5 reports results for Model (2). Of the monitoring cost associated factors for adoption, R&D expenses, capital intensity, and company size were positively and significantly associated with the likelihood of adopting a broad-based stock option plan for this sample. Compared to the cross-sectional results, the most important differences were that the market-to-book ratio had a positive, but insignificant effect on adoption (p-value of 0.14), whereas company size, as measured by the natural logarithm of employment, had a strong positive

effect. As far as risk factors are concerned, higher variance in annual TSR was a significant predictors of adoption, although the significance level was low by conventional standards (p-value of 0.082). Interestingly, high variance in annual sales was negatively associated with the probability of adoption, contrary to the cross-sectional results where it was positively associated with the probability of having a broad-based stock option plan[10]. As with the cross-sectional results, liquidity is positively associated with the probability of adoption (p-value 0.077). However, the other measures of financial strength indicate that adopters did not differ from non-adopters in terms of profitability, interest, and debt burdens. Union presence had a strong negative effect on employee stock-option plan adoption. For the sample studied, past growth did not influence the probability of adopting an employee stock option plan. Factors associated with monitoring costs such as expected growth and high levels of intellectual capital, as well as capital intensity and size increased the probability of adoption. Consistent with agency theory, higher levels of business risk decreased the probability of adoption of broad-based stock option plans. Interestingly, higher levels of TSR volatility increased the probability of adoption, perhaps reflecting the fact that such plans are only valuable when TSR has been growing and is expected to continue to grow. Overall, these results are also in accord with theory, and they support most of the findings of the cross-sectional analysis reported in Table 4.

This study has a number of *limitations* that need to be considered when interpreting our results. Our dataset contains only publicly owned companies listed in Standard and Poor's COMPUSTAT database. Therefore, these results do not apply to privately held companies (be they small start-ups or large established businesses). Also, our measure of stock-option plan

presence may contain some error, in that some smaller companies may have been overlooked by the media, and thus identified erroneously as not sponsoring an employee stock option plan. Additionally, our sample size for Model (2) is rather small.

Conclusions

In this paper, we shed light on firm characteristics associated with the adoption of broad-based stock option plans. We use an agency theory framework and hypothesize that higher monitoring costs may prompt firms to adopt group incentive plans in general, and employee stock options in particular. We reason that higher monitoring costs occur in firms that are large, have experienced high growth, have high levels of intellectual capital and expected growth, and high capital intensity. Both our cross-sectional and longitudinal results provide evidence that monitoring cost considerations associated with intellectual capital and expected future growth, as well as capital intensity, are significant predictors of the adoption and maintenance of broad-based stock option plans. The results for company size differed between the cross-sectional and longitudinal analysis, with size being a significant predictor of adoption, but not of maintenance. Overall, our results suggest that higher monitoring costs prompt firms to adopt and maintain employee stock option plans.

Risk, measured as variability in sales and TSR, was positively associated with the probability of stock option plan presence in 1999. Our cross-sectional results indicate that firms with higher levels of variability in sales and TSR are more likely to shift some of that risk to employees through stock-based compensation. However, our longitudinal analysis indicates that higher business risk is associated with a lower probability of adoption of broad-

based stock option plans. Further research using more longitudinal data is needed to better understand this phenomenon and its implications for employee perceptions, compensation structure and public policy with respect to stock compensation.

We also reasoned that financial constraints might be why firms adopt these plans. The empirical evidence did not support this view. On the contrary, broad-based stock option firms appeared to have better liquidity compared to non-adopters. This finding may be due in part to the fact that our sample is restricted to companies that adopted stock options plans after several years of existence as a public company. It may very well be the case that pre-IPO, small start-ups use employee stock options to deal with financial constraints. These results support the claims that broad-based stock options may help companies preserve cash by substituting stock for cash compensation, and by generating tax benefits in a rising stock market. Interestingly, our adoption analysis indicates that firms that adopted employee stock option plans had higher liquidity *before* they adopted the plan and before any tax benefits thereof could materialize. A possible explanation for this finding is that firms that offer broad-based options are high growth firms that often engage in acquisitions, hence their effort to have readily available cash. Debt burdens were not found to be higher for adopters or maintainers. The results for the other financial health indicators differed for the cross-sectional and longitudinal analysis, suggesting that maintainers (but not adopters) had lower interest burdens and lower profit margins.

Overall, we conclude that firms behave according to agency theory predictions as far as decisions to adopt and maintain employee stock option plans are concerned. Firms that rely heavily on difficult to observe human capital are more likely to adopt broad based stock

options, and based on our theoretical review, this is a rational course of action. They are also the firms with the most to gain from the use of such market-based incentives. Also, union firms are less likely to adopt and maintain such plans, and financial constraints do not appear to be driving the adoption decision. Whether broad-based stock option plans help tie crucial human capital to the firm or rather promote greater effort and information sharing remains open questions. Further research into plan design and employee attitudes and motivation is needed to address these questions.

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Table 1

Variable Definitions

Dependent Variable

SO	Dummy variable indicating the presence of a broad-based SO plan in 1999

Independent Variables, Monitoring Costs

growth	Average of ln(sales/sales_t-1) over the 'Compustat life' of the firm
lnavmb	Ln(3 year average of the market-to-book ratio)
lnavrd	Ln(3 year average of R&D expenses scaled by assets)
avkl	Ln(3 year average of the book value of PPE per employee)
avsize	Ln (3 year average of employment)

Independent Variables, Risk

lnsdsal	Ln(standard deviation of annual sales, over the 'Compustat life' of the firm)
lnsdtsr	Ln(standard deviation of total annual shareholder return, over the 'Compustat life' of the firm)

Independent Variables, Financial Constraints

lnavdeq	Ln(3 year average of long-term debt scaled by invested capital)
lnavinter	Ln(3 year average of interest expense as a percent of operating income)
lnavcash	Ln(3 year average of cash as a percent of total assets)
lnavpm	Ln(3 year average of net income before extraordinary items as a percent of sales)

Independent Variables, Other

union	Dummy variable indicating presence of union
industry	10 industry dummies (4 digit SIC codes)

Variable Definitions (continued)

Dependent Variable

SOch Dummy variable indicating the adoption of a broad-based SO plan in year t

Independent Variables, Monitoring Costs

growth Average yearly growth rate of sales up to year t-1

mb1 Market-to-book ratio in year t-1

rd1 R&D expenses as a percent of total assets in year t-1

kl1 Log of the book value of PPE per employee in year t-1

size1 Log of employment in year t-1

Independent Variables, Risk

sdtsr1 Standard deviation of total annual shareholder return, all years up to year t-1

sdsal1 Standard deviation of annual sales, all years up to year t-1

Independent Variables, Financial Constraints

lndeq1 Long-term debt scaled by invested capital in year t-1

lninter1 Interest expense as a percent of operating income in year t-1

lncash1 Cash as a percent of total assets in year t-1

lnpm1 Net income before extraordinary items as a percent of sales in year t-1

Independent Variables, Financial Constraints

union1 Dummy variable indicating presence of union

year Dummy variables for year

Note: All variables are adjusted for inflation.

Table 2

Industry distribution of broad-based stock option companies, 1999

Industry	% of Compustat Companies	% of Compustat Industry Employment
Food, textile, apparel, shoes, leather	3%	7%
Lumber, paper, printing	6%	11%
Chemical, petroleum, rubber, stone	5%	8%
Metal, fabricated metal, machinery	9%	16%
Other manufacturing	9%	12%
Transportation, communication, utilities	4%	8%
Wholesale	3%	9%
Retail	3%	5%
Finance, real estate, insurance	1%	4%
Services	6%	12%
All Companies	5%	9%
Total number of stock option firms	453	1,623,498
Total number of Compustat companies	9060	18,038,867

Table 3

Descriptive statistics, levels in 1999

Variables	Mean	s.d.
SO	0.072	0.259
growth	0.167	0.270
Lnavmb	0.656	0.645
Lnavrd	-6.329	3.280
Avkl	3.148	1.294
Avsize	-0.130	2.187
Lnsdsal	3.867	2.192
Lnsdtsr	4.004	0.885
lnavdeq	-2.606	2.878
lnavinter	-1.992	2.197
lnavcash	-2.713	1.505
lnavpm	-5.460	3.089
union	0.150	0.357
Food, textile, apparel, shoes, leather	0.047	0.212
Lumber, paper, printing	0.042	0.200
Chemical, petroleum, rubber, stone	0.109	0.311
Metal, fabricated metal, machinery	0.115	0.319
Other manufacturing	0.194	0.396
Transportation, communication, utilities	0.104	0.305
Wholesale	0.052	0.221
Retail	0.082	0.275
Finance, real estate, insurance	0.071	0.256
Services	0.184	0.388
N	4081	

Table 4

Cross-sectional analysis

Dependent variable: Presence of a broad-based stock option plan in 1999

Variables	Coeff.	Robust s.e.	Marginal effect for unit increase in IV^
growth	-0.219	0.199	
Lnavmb	0.508	0.110 ***	3.9%
Lnavrd	0.207	0.033 ***	1.4%
Avkl	0.249	0.075 ***	1.7%
Avsize	0.130	0.088	
Lnsdsal	0.448	0.083 ***	3.4%
Lnsdtsr	0.094	0.078	
lnavdeq	0.014	0.036	
lnavinter	-0.113	0.040 ***	-0.7%
lnavcash	0.249	0.078 ***	1.7%
lnavpm	-0.095	0.027 ***	-0.6%
union	-1.143	0.219 ***	-4.4%
Constant	-4.531	0.712 ***	
Industry dummies	yes		
N	4081		
Wald chi2(21)	369.4	***	
Pseudo R2	0.2186		
Estimated probability	6.7%		

^At the means of the independent variables; dummy variables are set at 0

***Significant at the 0.01 level

Note: The omitted categories are non-union, of the lumber/paper/printing sector

Table 5

Panel data analysis, 1990-1999

Dependent variable: Adoption of a broad-based stock option plan in year t

Variables	**coeff.**	**s.e.**
Growth	0.164	0.224
mb1	0.359	0.242
rd1	0.281	0.060 ***
kl1	0.463	0.143 ***
size1	0.623	0.176 ***
sdsal1	-0.320	0.166 *
sdtsr1	0.317	0.183 *
deq1	-0.002	0.075
inter1	-0.060	0.078
cash1	0.240	0.136 *
pm1	0.044	0.061
union1	-1.568	0.572 ***
Constant	-6.059	1.352 ***
year dummies	yes	
Wald chi square	64.920	***
N (firm-years)	34,886	
Number of stock option non-adopters	5,365	
Number of stock option adopters	57	

Results are based on a population-averaged logit model.

Robust standard errors are reported.

Stata's xtlogit routine was used.

Endnotes

[1] See Morgenbesser, Casani, & Gemson (2002) for a recent review of pending legislation on the accounting treatment and disclosure of stock options.

[2] Assuming that stock price increases between the option grant date and the date when the options vest, and assuming that employees exercise their options.

[3] For the purposes of this paper, a broad-based employee stock option plan is defined as one where more then 50% of employees receive stock options.

[4] The theory rests on the assumption that people are self-interested utility maximizers who are both effort-averse and risk-averse.

[5] Stata Version 6.0 (Stata Corporation, TX, USA) was used to carry out the statistical analysis.

[6] This is so because the cost of acquiring the firm's assets (its book value) is deemed by investors to be relatively small, compared to the future prospects of the firm.

[7] The agriculture, mining, and construction sectors are excluded from this table and the subsequent analysis, due to the extremely small number of companies with broad-based stock options in these sectors (0, 3, and 1 respectively).

[8] In the cross-sectional model, using variability in sales alone as a proxy for facing a risky business environment produced a statistically significant coefficient of 0.455; when used alone as an indicator for market risk, the coefficient for variability in TSR was 0.132, and it was statistically significant at the 0.08 level.

[9] One of the authors attended a presentation on employee stock-option plans by a by a former Pepsico HR manager who made this statement.

[10] In the longitudinal model, using only variability in sales as a proxy for facing a risky business environment produced a statistically significant coefficient of -0.427 ($p=0.002$); when used alone as an indicator for market risk, the coefficient for variability in TSR was 0.284, and it was statistically not significant ($p=0.131$). The variability of total shareholder return was negatively correlated with the variability of sales ($r = -0.19$).