

Long-Run Investment Decisions, Operating Performance and Shareholder Value Creation of Firms Adopting Compensation Plans Based on Economic Profits

Chris E. Hogan
Edwin L. Cox School of Business
Southern Methodist University
P.O. Box 750333
Dallas, Texas 75275-0333
chogan@mail.cox.smu.edu

Craig M. Lewis
Owen Graduate School of Management
Vanderbilt University
Nashville, Tennessee 37203
craig.lewis@owen.vanderbilt.edu

August 2004

The authors thank seminar participants at the 2000 Summer Symposium at the Hong Kong University of Science and Technology, University of Arizona, Goethe University, London School of Business, Ohio State University (Accounting and Finance), Southern Methodist University, Texas A&M University, and Vanderbilt University; especially Bill Christie, Gerald Garvey, Tim Loughran, Ron Masulis, and Ralph Walkling. The authors also would like to thank Flora Chen, Oliver Chen, Ping Dong, Brad Ogle and Stephan Schulze for capable research assistance.

Long-Run Investment Decisions, Operating Performance and Shareholder Value Creation of Firms Adopting Compensation Plans Based on Economic Profits

Abstract: For firms adopting economic profit plans between 1983 and 1996, we document changes in investment behavior that lead to improvements in operating performance and growth opportunities relative to their own past performance. These improvements, however, are similar to those realized by a set of nonadopting control firms that are selected on the basis of a logistic regression model of adoption choice. We then consider the possibility that some firms are better candidates for economic profit plans than others and classify adopters according to whether they made anticipated or surprising choices based on the adoption choice model. We find that anticipated adopters make changes in investment behavior that reduce invested capital and allow them to become more profitable than a sample of control firms that were expected to adopt but chose to continue using a traditional plan. A similar analysis of surprise adopters does not reveal significant performance differences relative to a sample of anticipated nonadopters. The classification analysis suggests that economic profit plans work best for firms that are expected to adopt such plans based on pre-adoption operating, organizational, financial, and compensation characteristics.

Keywords: Economic profits, investment policy, operating performance, compensation plans, shareholder value creation

Data Availability: Data are publicly available from sources identified in the paper

I. Introduction

A recent trend in executive compensation is to pay managers performance bonuses based on the creation of economic profits rather than accounting earnings.¹ Economic Profit Plans (EPPs) reward managers if earnings exceed a charge for the use of the capital employed in the business and provide incentives to accept new projects and maintain existing lines of business only if they have positive net present value. This implies that an appropriately designed EPP should provide incentives for improving investment decisions and operating performance because it links executive compensation to a performance metric that directly corresponds to shareholder value creation.²

The main hypothesis we consider is simple. If EPPs provide managers with better incentives to improve shareholder value, firms that adopt such plans should invest more efficiently and experience improved long-run operating performance.³ Wallace (1997) finds that firms adopting economic profit plans do in fact produce higher levels of economic profits. He shows that adopting firms decrease new investment, increase asset dispositions, and repurchase more shares and argues that economic profit improvements are primarily driven by capital management decisions that reduce invested capital.⁴

¹ The concept of economic profits, the need to earn more than the cost of capital to create wealth, dates back centuries (Biddle et al. 1997; Hamilton 1777) and has been operationalized as residual income in the 1950s (Zimmerman 1997; Biddle et al. 1997). Recently, plans that compensate managers on the basis of economic profits have gained wide acceptance, with adoption by blue-chip companies that include Boise Cascade Corp., the Coca-Cola Company, and Eli Lilly & Co. The management consulting firm of Stern Stewart and Co. is the leading advocate of the economic profit approach, which it markets under the name of Economic Value Added (EVA™). Other consulting firms such as the Boston Consulting Group, KPMG, and LEK/Alcar Consulting Group offer similar plans.

² A problem that these plans share with all bonus plans is that they only reflect current operating performance and tend to induce a short-term orientation. To address this concern, many EPPs include long-run incentives not used in traditional bonus plans. For example, Stern, Stewart and Company advocates an approach that includes a bonus-banking system whereby a portion of a manager's bonus each year is banked and only paid if economic profits continue to rise. Another approach uses the discounted sum of forecasted economic profits as a measure of long-run value creation. Both of these approaches create long-term incentives by requiring bonus payments to explicitly reflect a longer horizon.

³ Murphy (1998) argues that incentives are an important driver of managerial actions and corporate performance and that "fully analyzing and documenting the effect of executive incentives on subsequent performance is a fruitful, if not critical, direction for future research in executive compensation."

⁴ Although not related to operating performance, other studies examine the effect of economic profit plan adoptions. Biddle, Bowen, and Wallace (1997) suggest that stock prices respond more to traditional earnings

Two econometric design problems make it difficult to draw inferences from Wallace (1997). First, he fails to control for past operating performance when identifying control firms. Barber and Lyon (1996) show that failing to account for past performance results in biased test statistics. This is particularly important when the firms being studied are relatively poor performers, which is likely to be the case when firms make significant changes in their compensation structure.

Second, compensation plans reflect an endogenous choice made by the firm's Board of Directors. Since Board compensation committees presumably choose the compensation plan that works best, it is important to control for this endogeneity bias when constructing empirical tests. That is, certain firms may be better candidates for EPPs, and compensation committees optimally select these plans. For example, Garvey and Milbourn (2000) argue that the capital charge may make EPPs more attractive to firms that would benefit from the added incentive to manage capital.⁵ Other firms may find it optimal to choose traditional plans. If all firms are optimizing, then each may realize significant performance improvements. As a result, there may not be any differences in performance across a sample of EPP adopters and a sample of control firms if you do not control for the endogeneity of the decision.⁶

We examine the investment behavior, operating performance and changes in shareholder value of firms adopting EPPs in the nine-year window around the adoption year. We find that the operating performance of companies adopting EPPs, as measured by numerous accounting measures, significantly improves in the four-year period following plan

than economic profits. Lehn and Makhija (1997) show that CEO turnover is lower in firms that have higher levels of economic profits.

⁵ Garvey and Milbourn (2000) argue that EPPs provide value beyond traditional earnings-based plans when economic profits are more highly correlated with stock returns and argue that a switch to an EPP should result in improved performance if economic profits combined with stock prices are more informative. Biddle et al. (1997) and Garvey and Milbourn (2000) both find that, on average, earnings tend to have a higher correlation with stock returns than does economic profit. However, Garvey and Milbourn (2000) examine when and why economic profits beats earnings, and whether this is associated with adoption.

adoption. In addition, managers respond to plan incentives to reduce invested capital by selling underperforming assets. This finding is consistent with Wallace (1997) who notes that “you get what you measure and reward.”

Before concluding that these improvements are attributable to the economic profits approach, we address the endogenous nature of the choice of a compensation plan. We propose two econometric procedures based on the propensity score matching methods of Dehejia and Wahba (1998). The main advantage of the propensity score approach is that, unlike other matching methods that only control for a relatively small number of factors (e.g. Barber and Lyon (1996)), it accommodates as many factors as are deemed important. For example, in addition to the typical controls for industry, size, and past operating performance, we include other factors such as compensation structure, managerial ownership levels, diversification measures, and capital structure.

When evaluated as a group, EPP adopters do not produce better operating performance or larger increases in shareholder value relative to firms with traditional compensation plans. In fact, there are very few significant differences in operating performance and shareholder value across adopters and nonadopters either before or after adoption. The only consistently significant difference is that asset turnover is significantly higher for EPP adopters.

Of course, these tests may not be sufficiently powerful to detect significant differences if, for example, some firms are more committed to the change than others. When we partition the sample into anticipated and surprise adopters, a different picture emerges. Anticipated adopters do attain many of the benefits that EPP proponents advocate. We find that assets are managed more efficiently, key profitability measures are higher, although, surprisingly, not economic profits, and more shareholder value is created than a set of

⁶ Ittner and Larcker (2001) make this point in a study that examines the choice of accounting systems.

comparable firms that were expected to adopt but chose traditional plans instead. By contrast, surprise adopters fail to achieve similar improvements. We conclude that economic profit plans work best for firms that are expected to adopt such plans based on pre-adoption operating, organizational, financial, and compensation characteristics.

The paper is organized as follows. We describe our data sources and sample selection procedure in section 2. In section 3, we evaluate both pre-adoption and post-adoption operating performance of firms that adopt EPPs. In section 4, we consider whether managers endogenously select EPPs or traditional compensation plans. Section 5 summarizes and concludes.

II. Sample Description and Data Sources

The sample consists of all adoptions of EPPs during the 1983-1996 period. The initial sample of EPP adopters was obtained based on a keyword search of proxy statements on the *LEXIS/NEXIS* database. The keywords used to perform this search are: Economic Value Added, EVA, Residual Income, Economic Value Management, and Economic Profit.

For all Stern Stewart & Co. clients, we use the adoption date identified by Stern Stewart & Co. For all other EPP adopters, we read proxy statements for each company to determine that the firms did in fact adopt an EPP. We verify the adoption year by reading prior year proxy statements to ensure that the adoption year was the first year the firm mentioned economic profits in its proxy statements. We also add three firms identified in Wallace's (1997) study that were not identified by our above search.

Regulated utilities (SIC = 481 and 491-494) and financial institutions and their holding companies (SIC = 600-699) are excluded from the final sample. Since our study uses accounting-based measures of operating performance, we also require that the adopting company appear on the Compustat Annual Research database in the year of and the year

prior to the EPP adoption. These industry and data restrictions result in a final sample of 108 firms.⁷

Summary information on the number of EPP adopters by year of adoption and industry affiliation is provided in Table 1. The number of adoptions has mainly increased through 1996 suggesting the popularity of these plans continued to increase during the early 1990s. Balachandran (2003) notes, however, that this trend reverses in the two years that immediately follow the end of our sample period.

Panel B of Table 1 provides two-digit SIC codes for our sample. EPP firms represent a broad cross-section of industries, suggesting that EPPs are considered a useful tool for motivating managers in a variety of business contexts.

III. Analysis of Investment Decisions, Operating Performance and Shareholder Value of Firms Adopting Economic Profit Plans

We examine how EPP adoptions affect investment decisions, operating performance and shareholder value. Table 2 reports median values for three investment decision variables, nine operating performance variables, and one measure of shareholder value. The variable definitions and calculation details are described in Table A1.

We report results for years -4 through +4, where year 0 is the fiscal year of the EPP adoption.⁸ We test for differences in performance over different time periods using t-tests for differences in mean values. T-tests are appropriate here, even though operating performance data tends to be skewed, because each firm is compared to its own past performance rather than that of other firms. Differences taken relative to “own” past performance mitigate the skewness problem found in cross-sectional comparisons.⁹

⁷ A complete list of adopting companies and the years of adoption is available upon request.

⁸ We lose observations due to firms delisting over the four-year period following adoption. Twenty-three adopters delist over this period: eighteen delist as a result of a merger and 5 were delisted by the exchange.

⁹ Nonparametric tests based on the Wilcoxon rank sum test are qualitatively similar.

The investment policy variables include new investment, asset disposals, and acquisitions, all of which are scaled by total assets. These measures reflect the rate of incremental long-term investment and the rate of asset disposals.

Proponents of EPPs argue that managers have incentives to invest in positive NPV projects because bonuses are only earned if income exceeds a charge on all capital. Since all assets incur capital charges, managers will sell underperforming assets that generate accounting earnings but fail to earn their cost of capital. We expect asset disposals to increase following an EPP adoption.

Unfortunately, the prediction for new investment is less clear. To the extent that some firms overinvest in negative NPV projects that generate accounting profits, new investment should decrease. However, if firms underinvest in positive NPV projects that have relatively low profitability rates, EPP adoptions could increase new investment. As a result, the predicted sign is indeterminate.

Any compensation plan, however, can undermine the selection of positive NPV projects if bonuses are based on short run realizations, whether it is cash flow, earnings, or economic profits. Given that the typical investment has poor operating performance in the early periods, upwardly mobile managers are likely to avoid such projects because they want to be promoted before middle-to-late period cash flows can offset early “losses.” Under this scenario, new investment would decrease following an EPP adoption because managers wish to avoid the additional capital charges.

It is similarly difficult to predict how acquisition activity changes. For analogous reasons, the predicted sign for changes in acquisition activity is indeterminate.

Our analysis of operating performance provides evidence on economic profits, accounting rates of profitability and the use of assets-in-place. We first examine “top-level”

operating performance measures. These include economic profits, operating income before depreciation (OIBD), and net income, all scaled by total assets.

We then break the “top-level” measures into components so that we can determine whether changes result from managing the asset base or from changes in margins. We examine economic profit, OIBD, and profit margins. These represent the same definitions of operating performance used to evaluate top-level performance except that we scale by sales rather than assets. All of these “margin” measures are expected to increase following an EPP adoption. Since EPPs are designed to reward managers for creating higher economic profits, improvements are expected to be greatest for economic profit margins and smallest for profit margins.

We then examine three measures of asset turnover to analyze asset utilization: asset turnover, accounts receivable turnover, and inventory turnover. Since managers of firms adopting economic profit plans are predicted to use assets more efficiently and have incentives to reduce the asset base, all of the turnover ratios are expected to increase following adoption.

Finally, we examine changes in shareholder value following the adoption of an EPP using the market-to-book ratio. We expect the market-to-book ratio to increase following an adoption if performance improvements are expected to be permanent.

A. Changes in Investment Policy for EPP Adopters

Panel A of Table 2 presents median investment measures for adopting firms, and Panel B presents t-statistics from tests of the differences in mean investment measures across various time periods.

As noted above, we predict that the capital charge implicit in EPPs provides an incentive to sell underperforming assets. Consistent with this prediction, we find that asset

sales increase (t-stat = 4.78) in the post-adoption period. There also is a significant decrease in new investment (t-stat = -6.51) but no significant change in acquisition activity.

It is interesting that adopting managers respond by finding ways to decrease the capital charges on invested capital. As we document later in section III.C, market-to-book ratios increase following adoptions, which suggests that investors believe these changes are beneficial. If so, the reduction in new investment is consistent with the idea that managers invest more efficiently following the adoption of an EPP.

B. Changes in Operating Performance

Operating performance measures are also presented in Table 2. Panels A and B of Table 2 indicate that “top-level” operating performance of EPP firms generally improves following adoption. The median value of economic profits to assets increases from the pre- to post-adoption period, although the changes based on ttests for differences in mean values are only significant in years 2 and 3 relative to year -1.

With one exception, the median economic profit to assets ratio is negative over the nine-year period surrounding adoption. This is consistent with evidence presented by Biddle et al. (1999) who note “near-zero EVA is consistent with a competitive economy in which even the typical large firm has difficulty earning more than its cost of capital.”

The median ratio of OIBD to assets increases from 15.16% in the year prior to adoption to 16.34% in the year of adoption and then reverts to levels comparable to those immediately prior to adoption. Increases in return on assets are significant in four of the years following adoption. For the median adopter, return on assets increases from 3.92% in the year preceding adoption to a high of 5.41% three years after adoption before falling back to 5.29% four years following adoption. The ttests for differences in mean performance measures in the pre-adoption period (years -4 through -2 compared to year -1) presented in

Panel B of Table 2, suggest that the adopter firms were experiencing a decline in profitability prior to adoption.

Turning to the components of the top-level operating performance measures, the median EP margin does not change significantly following the adoption of an EPP. By contrast the median OIBD margin, a measure that is not affected by a change in the adopting firm's assets-in-place and/or interest expense, significantly increases from 13.11% in the year prior to adoption to 14.69% four years following adoption. Median profit margins significantly increase from 2.82% in the year prior to adoption to 4.33% four years following adoption. Increases in OIBD and profit margins are generally significant in all years following adoption.

Note that the ratio of economic profits to assets shows significant improvement in two of the four post-adoption years while the economic profit margin is insignificant. This suggests that improvements in economic profits are caused by capital management decisions rather than margin improvements.

The changes in the asset components are consistent with this observation. We find that total asset turnover and inventory turnover both increase significantly in the post-adoption period as compared to the pre-adoption period, although the annual increases relative to year -1 are not significant. Average accounts receivable turnover actually decreases in the post-adoption period as compared to the pre-adoption period, although the annual decreases relative to year -1 are not significant.

C. Shareholder Value Measure

The median adopter's market-to-book ratio increases from 2.372 in the year preceding adoption to 2.835 four years after adoption, suggesting the market is anticipating positive effects from EPP adoptions. It appears that investors believe that the changes are permanent as evidenced by the significant increases in market-to-book ratios.

IV. The Endogenous Nature of the Adoption Decision

Table 2 documents that firms change their investment behavior, experience improvements in certain operating performance measures and increase shareholder value following the adoption of an EPP. The question remains as to whether these results are significantly different than what would have been expected had the firm not selected an EPP. One possible approach for evaluating expected performance is to compare the operating performance of our sample of adopters to a sample of control firms matched on size and industry membership, similar to Wallace (1997).¹⁰

Unfortunately, this approach ignores prior profitability and the endogeneity inherent in the selection of a compensation plan. The problem here is that, if all firms choose optimal compensation plans, whether it be an EPP or a more traditional plan, we may not observe differences in performance across a sample of EPP adopters and nonadopters (Ittner and Larcker 2001). The question we seek to answer then is really whether the adopting firms are performing better subsequent to adoption than they otherwise would have had they not adopted an economic profit plan.

Ideally, we would like to compare the operating performance of adopting firms to their performance had they not adopted. Since this obviously is not possible, we use the method of matching based on propensity scores to identify the “best” control firms.

Propensity score matching methods, as used by Dehejia and Wahba (1998) and Villalonga (2000) are useful when there are numerous characteristics across which firms may be matched (for example, industry, size, operating performance, compensation structure, and capital structure.). The propensity score is a measure of the likelihood of an EPP adoption. It is the fitted value from a logistic prediction model that incorporates these different

¹⁰ When we select control firms matched on year, industry, size and prior profitability, and compare performance between adopter firms and control firms, our results are qualitatively similar to those presented in Table 5.

characteristics. The basic idea is to use the propensity scores from the prediction model to select a set of control firms that are most similar to the adopter firms. This produces a set of control firms that provide the best indication of how an adopter would have performed had they not adopted.¹¹

As an additional test, we compare the investment decisions, operating performance and shareholder wealth creation of an adopting firm to the operating performance of a *comparable* firm that was expected to adopt based on the adoption prediction model but selected a traditional compensation plan instead. If firms endogenously choose the best compensation plan, those that choose as anticipated should outperform a matched sample of firms that make surprising choices. The inability to reject the null hypothesis of no performance improvement suggests that both plans are equally effective.

A. A Model to Predict EPP Adoptions

In an effort to identify characteristics of firms that adopt EPP plans, we estimate a logitistic regression model where the dependent variable is equal to one if the firm adopts an EPP during the current fiscal year and zero otherwise.

The sample includes all EPP adopters (108 firms) in their year of adoption, and all firms in the Execucomp database with the same 2-digit SIC code and year as the EPP adopters plus one hand-collected control firm for each adoption prior to 1992, for a total of

¹¹ The propensity score matching method outperforms other methods, such as the Heckman's two-stage model when self-selection is a concern, in terms of estimating treatment effects (see Rosenbaum and Rubin 1983; Villalonga 2000; and Dehejia and Wahba 1998) because it discards potential control firms that are not comparable. Methods such as Heckman's two-stage model can result in biased estimates of the treatment effect when noncomparable firms are included in the estimation. The extent of this bias depends on the comparability of the sample of adopters and the control sample. The more comparable the samples are across several dimensions, the less biased output from OLS or two-stage methods will be. Given that there are several factors that could influence a firm's decision to adopt an EPP, the propensity score matching method selects the most relevant group for comparison.

2,541 potential control firm-years.¹² Data requirements reduce the actual number of observations used in the logistic analysis.

The optimal compensation structure for a given firm should be driven by the underlying characteristics of the firm. Thus our model includes variables capturing growth opportunities, profitability, investment policy, capital and organizational structure, and compensation structure prior to adoption.

Since there are many more firms that choose traditional compensation plans, the factors that explain adoption choices in the cross-section will reflect the decisions of firms that want the discipline inherent in an EPP as well as those that actively avoid EPP plans. For example, a firm with economically unprofitable lines of business may prefer to adopt an EPP because this type of liquidation decision is explicitly rewarded. However, if these same assets generate accounting profits, managers may prefer traditional plans because they help increase bonus payments.

1. Discussion of explanatory variables

In this section, we discuss the variables that are used to estimate the logistic model of the decision to adopt an EPP. Variable definitions and calculation details are provided in Table A2.

Growth opportunities and profitability. Firms with high growth opportunities but relatively low income levels from assets-in-place will prefer stock-based compensation because the opportunity to earn an earnings bonus is limited. We include the market-to-book ratio as a measure of growth opportunities and expect the variable to be inversely related to EPP

¹² For firms that adopted prior to the availability of Execucomp data in 1992, we select one control firm using the following algorithm: in the fiscal year prior to adoption (using Compustat's fiscal year convention), we first select all firms in the same 2-digit SIC code with assets within 25% to 200% of the EPP firm, and then we select the firm with the closest OIBD to assets ratio that has a proxy statement available, since we need compensation data. This process ensures we have at least one control firm for each adopter. We obtain qualitatively similar results if we only consider firms that adopt EPPs after 1991.

adoption. Garvey and Milbourn (2000) also note that the calculation of economic profits is more problematic for growth firms, making adoption less likely.

Managers of firms with relatively high accounting profitability would be content to continue a more traditional earnings-based plan. We include the ratio of operating income before depreciation to total assets as a measure of accounting profitability and expect this measure to be inversely related to EPP adoption. Alternatively, firms with relatively high economic profits will prefer a compensation plan that rewards economic profits. We expect firms with relatively high economic profits to be more likely to adopt an EPP, particularly if traditional accounting measures limit the manager's ability to earn a bonus with an earnings-based plan. We include a dummy variable that equals 1 if the firm's economic profits are in the top third of their industry (defined as 2-digit SIC code), and 0 otherwise. We also interact this indicator variable with return on assets to determine whether, for this subset of firms with high economic profits relative to their industry counterparts, adoption is more likely when accounting profits are relatively low.

Investment policy. A firm's existing investment policy will likely play a major role in the choice of compensation plans, although the implications are not always clear. Managers of firms with high capital expenditures may not want to be constrained by compensation plans that require a charge for the cost of invested capital. By contrast, the Board and shareholders of firms with relatively high rates of capital expenditures may encourage an EPP adoption because the explicit capital charge creates incentives to select positive net present value projects and sell underperforming assets. We include capital expenditures plus R&D expenses relative to total assets as a proxy for the rate of new investment.

A similar argument can be made for firms with high levels of tangible assets and high levels of financial slack. Firms with high levels of tangible assets may benefit more from plans that create incentives to manage invested capital, but managers may prefer to avoid the

capital charges associated with an EPP. We use the natural log of total assets as a proxy for tangible assets.

Financial slack is measured as the ratio of cash and liquid assets to total assets. Large levels of cash suggest that managers may have significant levels of discretionary funds and would benefit from the implicit discipline inherent in an EPP with respect to new investment. However, the pecking order theory (Myers and Majluf 1984) suggests that firms with long-term investment plans will accumulate retained earnings because it is a low cost source of capital when managers have better information than shareholders. Such firms would be less likely to adopt an EPP because a capital charge is applied to financial slack even though it does not earn the cost of capital.

Capital and Organizational Structure More highly leveraged firms may already experience significant levels of external monitoring making an EPP adoption less likely. On the other hand, an economic profit plan may provide a complement to leverage in monitoring management. Debt holders may prefer the margin of safety provided by the incentive for management to cover the cost of all capital, not just interest on debt. We include long-term debt to total assets as a measure of the amount of financial leverage.

One advantage of using an EPP relative to stock-based compensation is that economic profits can be calculated at the divisional or business unit level, and thus is appealing for decentralized organizations. We use a measure of geographic diversity as a proxy for the extent of decentralization, which is calculated as the square root of the number of geographic segments. We use the natural log of sales as a second measure of decentralization because it reflects the scale of a firm's operations. We expect both of these measures to be positively associated with EPP adoption.

Compensation Structure Since EPPs are bonus-based plans, we include the percentage of total compensation from bonuses to control for the existing structure of the

compensation plan. It is measured as the logistic transformation of the proportion of bonus compensation to total compensation (the sum of the dollar values of salary, bonus, other compensation, savings plans, properties and insurance, long-term incentive payments, restricted stocks and stock options). Shareholders and/or Boards of firms with managers that have lower bonus-based compensation may favor adopting an EPP if they believe that bonuses based on economic profits give managers better incentives to focus on projects where returns exceed the cost of capital. This predicts an inverse relationship between EPP adoption and existing bonus compensation.

Ownership structure. The percentage of total shares held by the CEO is used to control for the existing ownership structure. If managements' interests are already aligned with shareholders as a result of their existing share ownership, the firm may be less likely to adopt an EPP. The total shares held by the CEO is measured as the sum of shares outstanding in option grants, unexercised options, and current shares held by CEOs divided by total shares outstanding plus options held by CEOs.

Table 3 shows the means and standard deviations for these variables for the adopter and nonadopter samples. Extreme outliers for all variables are winsorized at the 1% and 99% levels. Since the univariate differences are consistent with the estimates we obtain in the EPP prediction model, we do not discuss them here.

B. Estimation of the EPP Adoption Model

Since the sample is relatively large (2,649 firm-year observations) but contains few firms that actually choose to adopt an EPP (108 observations), the parameter estimates from a logistic regression model that uses the entire sample are likely to be poor. It has been shown that it is possible to obtain better coefficient estimates by stratifying the sample, with strata based on the decision to adopt an EPP (Manski and Lerman (1977) and Cosslett (1981)).

1. A Stratified Sampling Approach

A feature of the stratified sampling approach is that it oversamples adopters relative to nonadopters. If no adjustment is made, the maximum likelihood estimates are asymptotically biased. Manski and Lerman (1977) show how to correct for this by weighting the likelihood function for each observation by $Q(i)/H(i)$ where $Q(i)$ is the fraction of the total sample that select outcome i , $i \in \{adopter, nonadopter\}$, and $H(i)$ is the analogous fraction in the stratified sample.

We estimate the prediction model by selecting a stratified sample comprised of 100 adopters and 100 nonadopters.¹³ Rather than relying on the results of a single logistic estimation, we estimate the model parameters using the bootstrap method. Specifically, we draw 1000 stratified samples ($N = 1,000$) and estimate a separate logistic regression for each sample. The resulting sample of bootstrapped parameter estimates represents the sampling distribution of the estimators. The bootstrapped coefficient estimates and associated standard errors are estimated in the usual way.

2. Parameter Estimates of the EPP Prediction Model

Table 4 provides parameter estimates for four EPP prediction models.¹⁴ Focusing on the complete Model, we find that EPP adoptions are less likely for firms with higher market-to-book ratios (t-stat of -3.857), consistent with expectations. Also as expected, firms with relatively high economic profits (in the top third of their industry) are more likely to adopt EPPs (t-stat of 2.857). This effect is even more pronounced in the subset of firms with relatively high economic profits (HEPD=1) if accounting profits are relatively low. The coefficient estimate for HEPD interacted with ROA (t-stat of -3.041) suggests that the firms

¹³ We obtain similar results using samples of 50 and 75 adopters.

¹⁴ We also estimate the logistic model using the full sample without bootstrapping. The signs and the significance levels of the parameter estimates are qualitatively similar to those presented in column (4) of Table 4.

most likely to adopt an EPP are those that can benefit from switching from a traditional earnings-based plan. Managers are less likely to receive an earnings-based bonus as the accounting profitability is relatively low, but more likely to receive a bonus based on economic profits given that economic profits are relatively high.

Firms with fewer tangible assets (t-stat of -3.471) and less financial slack (t-stat of -4.266) are more likely to adopt EPPs. This suggests that firms are likely to avoid EPPs if they have high levels of invested capital unless they have opportunities to sell underperforming assets. Firms with greater geographic diversity (t-stat of 2.083) and greater scale of operations (t-stat of 3.231) are more likely to adopt an EPP, consistent with expectations.

Not surprisingly, firms that pay managers relatively high bonuses under traditional plans are less likely to adopt an EPP (t-stat of -2.585). Prior profitability (OIBD/assets), new investment, financial leverage, and shares held by executives are insignificant determinants of EPP adoption.

Table 4 also reports the pseudo R-square, which is calculated as 1 minus the ratio of the log-likelihood of the fully specified model to the log likelihood of a model that only includes an intercept. For Model (4), the average pseudo R-square over the 1,000 estimations equals 0.195.¹⁵ We also find that the average percentage of concordant observations across the 1,000 individual estimations equals 75.4%.

Using the bootstrapped parameter estimates, we estimate the threshold probability level (the probability cutoff value above which an observation would be classified as an adopter) that minimizes the sum of the probabilities of type I and type II errors. At the estimated threshold value for Model (4) of 2.9%, we find that the rate of correct classification for the entire sample is 67.7%. This compares to a predicted 50% rate of

correct classification from the naïve model. The 50% correct classification rate is the appropriate benchmark in this context because the models are estimated using an equal number of adopters and nonadopters. Our findings indicate that the bootstrapped estimates of the EPP prediction model do a good job discriminating between adopters and nonadopters.

C. The Propensity Score Matching Method

We use an algorithm for implementing the propensity score matching method that is described in Dehejia and Wahba (1998). First, we use the fitted values from the EPP adoption model as the propensity scores. Next we rank all adopters based on their propensity scores and divide them into quartiles. We eliminate all potential control firms with propensity scores less than the minimum propensity score for adopters or greater than the maximum propensity score for adopters. We then slot the remaining control firms into the propensity score quartiles based on the cutoffs for the adopting firms.

The final step is to ensure that the control firms within each quartile are good (comparable) matches for the adopters. T-tests for differences in means are performed across adopters and control firms, and within each quartile, for both the propensity scores and all other covariates from the logistic regression. If the matching procedure is successful, we expect very few significant differences in the propensity scores or the explanatory variables. If there are significant differences, Dehejia and Wahba (1998) suggest procedures to fine-tune the process.

1. Investment Decisions, Operating Performance and Shareholder Value Comparison Based on Propensity Score Matching

We calculate the propensity scores, or fitted values, using the bootstrapped estimates from Model (4) in Table 4. Using the algorithm described above, we obtain a sample of

¹⁵ Garvey and Milbourn (2000) report a pseudo- R^2 of .0725 in their EVA adoption model without industry dummies and 0.128 with industry dummies.

control firms. We find that there are few significant differences in the mean values of the propensity scores and the covariates between the adopters and control firms in the four quartiles, and conclude there is no need to fine-tune the matching process.

Panel A of Table 5 presents the median investment, operating performance and shareholder value measures for the nonadopters, averaged across the four quartiles. These measures can be compared to the same measures for the sample of adopters reported in panel A of Table 2. It is important to remember that the numbers presented in Table 5 are averages of the medians across the four quartiles, not the medians of the entire sample of nonadopters. For this reason, we do not present t-tests for differences in mean values across time periods. The z -statistics presented in Panel B represent average (across propensity groups) z -statistics from tests of the equality of distributions across EPP adopters and nonadopters using the Wilcoxon two-sample test. A positive sign indicates that the adopters tend to have higher values than the nonadopters.

The z -statistics suggest that asset turnover is significantly higher for the adopter firms in years -1 through year 2 . The only other significant difference is that OIBD/Assets is higher for adopters in years -4 and 0 . Overall, there are no significant differences in the investment policy and shareholder value variables and relatively few significant differences in operating performance between adopters and the control sample of nonadopters. Although we report average z -statistics here, the results are the same if we examine z -statistics for individual propensity groups.

D. A Second Endogeneity Test

The second endogeneity test compares the operating performance of firms that choose compensation plans according to the EPP prediction model to firms that make surprising choices. If an adopting firm makes the optimal choice, it should have better operating performance than a comparable firm that should have adopted but chose a

traditional plan instead. Similarly, if firms endogenously choose to compensate their managers with traditional plans, they should have better operating performance than firms that were expected to use a traditional plan but switched to an EPP.

The endogeneity test is conducted as follows.¹⁶ First, we build a 2×2 frequency table by cross-classifying the observed and predicted responses. There are four possible classifications: (1) firms that choose EPPs as predicted (anticipated adopters), (2) firms that choose EPPs even though they resemble firms that use traditional plans (surprise adopters), (3) firms that choose traditional plans as predicted (anticipated nonadopters), and (4) firms that choose traditional plans even though they resemble firms that use EPPs (surprise nonadopters). The next step compares the operating performance of the firms that behave as predicted to that of firms that make surprising choices using the same testing approach described in Section 4.

Using Model (4) and its threshold value of 2.9%, we cross-classify the entire sample of adopters and nonadopters based on the observed and predicted responses. This procedure identifies 72 anticipated adopters, 36 surprise adopters, 1,721 anticipated nonadopters, and 820 surprise nonadopters.

1. The Operating Performance of Anticipated EPP Adopters

A direct comparison of the 72 “anticipated” adopters and 820 “surprise” nonadopters is not particularly informative because the nonadopters have not been matched by industry or year. Since it is important to control for these characteristics as well as prior operating performance, we identify a sample of 72 matched firms from the sample of 820 “surprise” nonadopters using industry affiliation (two-digit SIC code), firm size (25% to

¹⁶ This test is motivated by Jung, Kim, and Stulz (1996) . They use qualitative dependent variable models to predict the outcomes of the endogenous decision to choose debt or equity. They then compare the stock market performance of firms that made issue decisions as predicted to those that issued against type.

200% of total assets in the year *prior to adoption*), and operating income (the firm with the closest OIBD/assets ratio in the year *prior to adoption*).¹⁷

If “anticipated” adopters endogenously choose the optimal compensation plan, they should experience better operating performance than firms that were predicted to adopt but did not. Panel A of Table 6 reports the same median investment, operating performance, and shareholder value measures for the 72 anticipated adopters as those in Panel A of Table 2. These results are consistent with those presented for the full sample of 108 adopters. In unreported t-tests for differences across time periods, the anticipated adopters show significant improvements in performance relative to their own past performance.

Panel B of Table 6 presents *z*-statistics from the Wilcoxon rank sum tests of the performance differences between the “anticipated” adopters and the matched sample of “surprise” nonadopters. The *z*-statistics indicate that anticipated adopters had significantly higher levels of EP/assets and OIBD/assets in the past (year -4) relative to surprise nonadopters, but their relative performance declined to the point where they became indistinguishable. By contrast, accounting profits (ROA) were significantly lower in the year prior to adoption, which likely resulted in smaller accounting-based bonuses. Firms may decide to switch to an EPP to reinforce desirable behavior. Since managers already generate relatively high levels of economic profits, an EPP makes it less attractive to pursue new ways of improving accounting profitability that also sacrifice economic profits.

Consistent with expectations, anticipated adopters make changes in their investment policies that improve operating performance and increase shareholder value. Table 6 indicates anticipated adopters sell more assets and have higher asset and inventory turnover

¹⁷ If no match is available using this criterion, then all firms that fail to adopt as predicted with (year prior to adoption) assets of 90% to 110% of the adopter are ranked, and the firm with the closest, but higher, Operating Income Before Depreciation/Assets ratio is selected as the matching firm. If an EPP adopter delists following adoption, both the adopter and the control firm are dropped from the analysis going forward. If a

rates than surprise nonadopters. They also generate higher levels of economic profits and OIBD than control firms. Unfortunately, these results are not particularly strong because, even though most of these measures have the correct sign, many of them are insignificant.

There are a number of cases where differences are significantly different from zero. The EP to assets ratio is significantly greater than the comparable firms in year +3 and EP margin is greater in years 0 and +3. In addition, the ratio of OIBD to assets is significantly greater for anticipated adopters relative to the surprise nonadopters in the year of adoption and in year 2, while ROA and profit margin are significantly lower in years -1 and +1.

Taken together, our results suggest that anticipated EPP adopters appear to make changes in their investment behavior that reduce invested capital and for the most part allow them to become more profitable. Although the evidence is not overwhelming, it is sufficient to conclude that improvements have occurred both relative to their own past performance and relative to firms that were expected to adopt but chose to remain with a traditional plan.

Finally, investors respond to adoptions by anticipated adopters as though the improvements are expected to be permanent. Table 6 indicates that the market-to-book ratio increases from 1.767 in the year prior to adoption to 2.410 in year 4. Not only is this increase highly significant but the change in the market-to-book ratio is significantly greater than the surprise nonadopters in year 2 (z -statistic of 2.10).

2. The Operating Performance of “Surprise” Adopters

The logistic model identifies 36 “surprise” adopters and 1,721 anticipated nonadopters that choose a traditional compensation plan as predicted. Using the same algorithm described above, we identify a sample of 36 matched firms from the sample of 1,721 anticipated nonadopters. Table 7 shows there is no clear pattern of improvements in investment decisions, operating performance or shareholder value for these firms, and there

control firm delists, we splice in an alternate control firm, also matched as of the year prior to adoption, going

is no evidence of significant differences between “surprise” adopters and nonadopting comparison firms. When this result is combined with our previous finding that anticipated adopters experience improved performance, it suggests that, on average, firms appear to be making compensation choices that work best for them.

V. Conclusion

We have analyzed the long-run investment decisions, operating performance and changes in shareholder wealth of firms adopting economic profit plans. For a sample of 108 firms that adopted EPPs between 1983 and 1996, we document significant improvements in operating performance and shareholder value in the years following adoption. While these results appear to support the hypothesis that EPPs motivate managers to make efficient investment decisions that ultimately improve profitability and shareholder value, we seek to answer the question of whether these firms are performing better than they would have had they not adopted an EPP, i.e., whether firms endogenously choose the “optimal” compensation plan.

Using our sample of EPP adopters and a sample of firms from Execucomp, we estimate a logistic model of the decision to adopt an EPP. We use the fitted values from this logistic regression to create a control sample matched on propensity scores, and also to classify firms into four groups: anticipated adopters, surprise adopters, anticipated nonadopters, and surprise nonadopters. We compare the investment decisions, operating performance and shareholder value creation of adopters to those of the propensity score control sample and are unable to reject the null hypothesis of no difference in investment decisions or shareholder value creation and find relatively few significant differences in operating performance between adopters and nonadopters.

We then compare the performance of “anticipated” adopters to “surprise” nonadopters to examine whether firms that were predicted to adopt an economic profit plan and did outperformed those predicted to adopt an economic profit plan but did not. Here we find evidence consistent with our main hypothesis. Firms manage assets more efficiently, operating performance improves, and shareholder value increases following an anticipated adoption. By contrast, when compared to a sample of “anticipated” nonadopters, “surprise” adopters fail to experience similar improvements.

We believe anticipated adopters have better experiences with EPPs because they have more to gain from the adoption. Since they were identified as better candidates for adoption *ex ante*, they were perhaps more likely to take the implementation seriously. This may also explain the absence of significant findings in our full sample tests. The inclusion of firms that make suspect choices may result in a loss of power because the level of measurement error is too high to detect significant differences. Thus, the findings in this study also highlight the importance of controlling for the endogeneity inherent in the choice of a new compensation plan when evaluating subsequent changes in performance.

Bibliography

- Balachandran, S.V., "How Does Residual Income Affect Investment? The Role of Prior Performance Measures." Working Paper, Columbia University (2003).
- Barber, B., and J. Lyon, "Detecting Abnormal Operating Performance: The Empirical Power and Specification of Test Statistics." *Journal of Financial Economics*, 41 (1996), 359-399.
- Biddle, G.C., R.M. Bowen, and J.S. Wallace, "Does EVA Beat Earnings? Evidence on Associations with Stock Returns and Firm Values." *Journal of Accounting and Economics*, 24 (1997), 301-336.
- _____, "Evidence on EVA." *Journal of Applied Corporate Finance*, 12 (1999), 69-79.
- Charoenruek, A., "The Role of Capital Structure in Tests of Asset-Pricing Models," Working Paper, Vanderbilt University, (2002).
- Cosslett, S. R., "Maximum Likelihood Estimator for Choice-Based Samples," *Econometrica*, 49 (1981), 1289 – 1316.
- Dehejia, R.H., and S. Wahba, "Propensity Score Matching Methods for Non-Experimental Causal Studies." Working Paper 6829, National Bureau of Economic Research (1998).
- Garvey, G.T. and T.T. Milbourn, "EVA versus Earnings: Does it Matter Which Is More Highly Correlated with Stock Returns?" *Journal of Accounting Research* 38 (2000 Supplement), 209-243.
- Hamilton, R., *An Introduction to Merchandize*. Edinburgh (1777).
- Ittner, C.D., and D.F. Larcker, "Assessing Empirical Research in Managerial Accounting: A Value-Based Management Perspective." *Journal of Accounting and Economics*, 32 (2001), 349-410.
- Jung, K., Y. Kim, and R. Stulz, "Timing, Investment Opportunities, Managerial Discretion, and the Security Issuance Decision." *Journal of Financial Economics*, 42 (1996), 159-185.
- Lehn, K., and A. Makhija, "EVA, Accounting Profits, and CEO Turnover: An Empirical Examination 1985-1984." *Journal of Applied Corporate Finance*, 10 (1997), 90-97.
- Manski, C. F., and S. R. Lerman, "The Estimation of Choice Probabilities from Choice Based Samples." *Econometrica*, 45 (1977), 1977-1988.
- Murphy, K. "Executive Compensation." Working Paper, University of Southern California (1998).

Myers, S. and N. Majluf, "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do Not Have." *Journal of Financial Economics*, 13 (1984), 187-221

Rosenbaum, P. and D. Rubin, "The Central Role of the Propensity Score in Observational Studies for Casual Effects." *Biometrika*, 70 (1983), 41-55.

Wallace, J.S., "Adopting Residual Income-Based Compensation Plans: Do You Get What You Pay For?" *Journal of Accounting and Economics*, 24 (1997), 275-300.

Villalonga, B., "Does Diversification Cause the 'Diversification Discount'?" *Financial Management*, 33 (2004), 5-29.

Zimmerman, J., "EVA and Divisional Performance Measurement: Capturing Synergies and Other Issues." *Journal of Applied Corporate Finance*, 10 (1997): 98-109.

Table A1. Description of Variables Used to Measure Performance.

Panel A reports the details of the calculation of variables that measure investment decisions. ItemXXX refers to annual Compustat data item XXX. All variables are contemporaneously measured unless otherwise indicated. Panels B, C, and D report top-level operating performance measures, measures of the components of operating performance, and a measure of shareholder value, respectively

Variable label	Variable description	Calculation details
<i>Panel A: Investment Decisions</i>		
New investment ¹	(Capital Expenditures + Research and Development)/Beg(Total assets)	(Item128 + Item046)/Beg(Item006)
Disposals/Assets ¹	Dispositions/Beg(Total assets)	Item107/Beg(Item006)
Acquisitions/Assets ¹	Acquisitions/Beg(Total assets)	Item129/Beg(Item006)
<i>Panel B: Operating Performance - Top Level</i>		
EP/Assets ^{1,2}	(Income before extraordinary Items+ 0.65*interest income - WACC*invested capital) /Beg(Total assets)	(Item018 + 0.65*Item015 - WACC*Item037)/Beg(Item006)
OIBD/Assets ¹	(OIBD + Interest income)/Beg(Total assets)	(Item013 + Item062)/Beg(Item006)
ROA ¹	Net income/Beg(Total assets)	Item172/Beg(Item006)
<i>Panel C: Operating Performance - Components</i>		
EP margin ²	(Income before extraordinary Items+ 0.65*interest income - WACC*invested capital) /Sales	(Item018 + 0.65*Item015 - WACC*Item037)/Item012
OIBD margin	(OIBD + Interest income)/Sales	(Item013 + Item062)/Item012
Profit margin	Net income including extraordinary Items/Sales	Item172/Item012
Asset turnover ³	Sales/Average(Total assets)	Item012/Average(Item006)
A/R turnover ³	Sales/Average(Accounts receivable)	Item012/Average(Item002)
Inventory turnover ³	Cost of goods sold/Average(Inventory)	Item041/Average(Item003)
<i>Panel D: Shareholder value</i>		
Market-to-book	Shares*Price/Book value of equity	(Item054*Item199)/Item060

Note 1: Beg(ItemXXX) indicates that the value is the beginning of period value for Compustat ItemXXX.

Note 2: The weighted average cost of capital is based on the Capital Asset Pricing Model. The risk free rate is the one month U.S. Treasury bill return from Ibbotson and Associates and is obtained from the Fama-French factors database (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). The market risk premium is assumed to be 7.5%. The unlevered beta is obtained from a market model regression where asset returns are the dependent variable and the value-weighted NYSE/AMEX/NASDAQ index is the market proxy. Asset returns are calculated as in Charoenrook (2002) who graciously provided the data. An industry average unlevered beta based on two-digit SIC code is used when asset returns are unavailable for particular firms.

Note 3: Average(ItemXXX) indicates that the value is the average of the beginning and end of period values for Compustat ItemXXX.

Table A2. Description of Variables Used in EPP Prediction Model

Panel A reports the details of the calculation of variables that measure growth opportunities and profitability variables; Panel B defines investment performance variables; Panel C describes capital and organizational structure variables; and Panel D describes compensation and ownership structure variables. ItemXXX refers to annual Compustat data item XXX. All variables are measured in the year prior to adoption.

Variable label	Variable description	Calculation details
<i>Panel A: Growth opportunities and profitability variables</i>		
Market-to-book	Shares*Price/Book value of equity	(Item054*Item199)/Item060
OIBD/Assets ¹	(OIBD + Interest income)/Beg(Total assets)	(Item013 + Item062)/Beg(Item006)
HEPD ²	High Economic Profit Dummy	Takes the value 1 if economic profits are in the top third percentile of each firm's industry (based on two-digit SIC code) and zero otherwise.
HEPD x ROA	Interact HEPD with ROA	HEPD*Item172/Item006
<i>Panel B: Investment policy variables</i>		
New investment ¹	(Capital Expenditures + Research and Development)/Beg(Total assets)	(Item128 + Item046)/Beg(Item006)
Tangible assets	Natural logarithm of total assets	ln(item006)
Financial slack	(Cash and liquid assets)/Total assets	Item001/Item006
<i>Panel C: Capital and organizational structure variables</i>		
Financial leverage	Long-term debt/Total assets	Item009/Item006
Geographic diversity ³	Square root of the number of geographic segments	Sqrt(Segment ItemXXX)
Scale of operations	Natural logarithm of sales	ln(item012)
<i>Panel D: Compensation and ownership structure variables</i>		
Bonus compensation ⁴	Bonus compensation is the logistic transformation of proportion of bonus compensation to total compensation.	Total compensation is the sum of the dollar values of salary, bonus, other compensation, savings plans, properties and insurance, long-term incentive payments, restricted stocks and stock options.
Shares held by executives ⁴	Shares held by executives is calculated as the logistic transformation of total shares held by the CEO.	Total shares held by the CEO is the sum of shares outstanding in option grants, unexercised options, current shares held by CEOs, and options held by CEOs, deflated by total shares outstanding .

Note 1: Beg(ItemXXX) indicates that the value is the beginning of period value for Compustat ItemXXX.

Note 2: See Table A1 for detailed description of EP/Assets calculation.

Note 3: Sqrt(ItemXXX) indicates that the value is the square root of Compustat ItemXXX.

Note 4: Variables are either obtained from the Execucomp database when available or hand-collected from proxy statements otherwise.

Table 1
Number of Economic Profit Plan (EPP) Adoptions by Year and Industry

Panel A reports the number of EPP adoptions per year; Panel B reports the number of EPP adoptions by industrial classification. The industries listed in Panel B (defined by Compustat 2-digit SIC codes) are those in which at least two firms adopted an EPP over the sample period. Regulated utilities (SIC = 481 and 491-494) and financial institutions and their holding companies (SIC = 600-699) are excluded.

Panel A: Number of EP plan adopters by year

Year	Number of Adopters	Percentage of Sample
1983	1	0.9
1987	1	0.9
1989	2	1.9
1990	2	1.9
1991	2	1.9
1992	8	7.4
1993	13	12.0
1994	26	24.1
1995	22	20.3
1996	31	28.7
Total	108	100.0%

Panel B: Number of EP plan adopters by industrial classification

Industry	SIC Code	Number of EPP Adopters
Chemicals and Pharmaceuticals	28	14
Industrial and Commercial Machinery and Computer Equipment	35	11
Communication and Electronic Equipment	36	8
Engineering & Scientific Instruments	38	7
Printing, Publishing and Allied Industries	27	5
Rubber and Plastic Products	30	5
Primary Metal Industries	33	5
Food and Kindred Products	20	4
Furniture and Fixtures	25	4
Fabricated Metal Products	34	4
Business Services	73	4
Paper and Allied Products	26	3
Transportation Equipment	37	3
Motor Freight Transportation and Warehousing	42	3
Electric, Gas and Sanitary Services	49	3
Wholesale Trade –Durable Goods	50	3
Wholesale Trade – Nondurable Goods	51	3
Engineering, Accounting, Research, Management, and Related Services	87	3
Other	-	16

Table 2
Tests of Changes in Investment Decisions, Operating Performance and Shareholder Value for EPP Adopters

Panel A reports median levels of investment decisions, operating performance, and shareholder value measures for the 108 firms adopting economic profit plans (EPPs) during 1983-1996. Variables definitions are described in Table A1. Panel B reports *t*-statistics testing whether mean measures are different across various time periods for the EPP adopters. The Post to Pre comparison is the average in the pre-adoption period of years -4 through -1 compared to the average of the post-adoption years 0 through 4.

Panel A: Adopter Median Values															
Fiscal Year Relative to Adoption	Investment Decisions			Top Level Measures			Operating Performance						Shareholder Wealth	# of Firms	
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book		
Predicted Sign	?	+	?	+	+	+	+	+	+	+	+	+	+	+	
-4	9.90%	0.06%	0.04%	-0.41%	17.82%	6.46%	-0.19%	14.44%	5.44%	1.123	6.135	4.171	2.067	77	
-3	8.79%	0.02%	0.00%	-0.33%	16.22%	5.47%	-0.18%	13.85%	4.21%	1.139	5.993	4.504	1.901	104	
-2	8.96%	0.02%	0.01%	-1.04%	15.01%	4.13%	-0.77%	13.04%	3.10%	1.136	6.322	5.014	2.122	107	
-1	8.19%	0.03%	0.03%	-0.84%	15.16%	3.92%	-0.68%	13.11%	2.82%	1.188	6.352	5.047	2.372	108	
0	9.07%	0.03%	0.77%	-0.39%	16.34%	4.83%	-0.21%	13.29%	3.86%	1.221	6.491	5.273	2.605	108	
1	8.78%	0.04%	0.03%	0.25%	15.70%	4.54%	0.21%	13.82%	3.99%	1.220	6.726	5.513	2.699	105	
2	8.64%	0.01%	0.43%	-0.29%	15.51%	5.38%	-0.21%	14.48%	4.74%	1.167	6.523	5.725	2.825	104	
3	8.09%	0.09%	1.04%	-0.40%	15.36%	5.41%	-0.18%	14.32%	4.69%	1.130	6.476	6.138	2.874	96	
4	7.19%	0.08%	0.29%	-0.72%	15.07%	5.29%	-0.51%	14.69%	4.33%	1.024	6.695	5.549	2.835	85	

Panel B: t-Statistics Testing the Differences in Performance Across Different Periods for Adopting Firms															
Test Years	Investment Decisions			Top Level Measures			Operating Performance						Shareholder Wealth	# of Firm- Years	
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book		
Pre to -1	-4.30	-0.87	0.64	-2.23	-2.83	-4.32	-0.72	-1.94	-3.19	1.61	0.96	1.41	-0.66	288	
0 to -1	-0.19	-0.24	-1.43	1.51	2.30	1.94	1.43	1.99	2.21	0.98	0.67	0.64	2.06	108	
1 to -1	0.14	1.68	0.53	0.62	0.78	1.37	0.42	1.16	1.96	0.12	-0.99	-0.20	3.34	105	
2 to -1	-0.25	0.75	-0.68	2.01	2.01	3.79	0.98	3.09	3.63	-0.15	-1.02	0.09	3.87	104	
3 to -1	0.59	1.83	0.35	1.75	1.10	2.81	0.21	1.83	2.53	-0.96	-1.04	-0.03	2.49	96	
4 to -1	-1.11	2.37	-0.14	1.15	0.20	2.74	0.07	2.75	3.20	-1.59	-1.07	0.34	2.19	86	
Post to Pre	-6.51	4.78	0.51	1.27	0.06	2.00	0.70	4.35	4.21	1.81	-2.17	2.99	8.85	1829	

Table 3
Means and Standard Deviations of Accounting and Compensation Structure
Variables Used in EPP Prediction Model

The table reports the means and standard deviations of accounting and compensation structure variables for adopters (108 firms) in the year prior to adoption and a sample of nonadopters with the same year and SIC code as the adopters (2,541 firm-years). Variables definitions are described in Table A2.

Variable	EPP Adopters 108 firm-years		Nonadopter sample 2,541 firm-years		T-test for equal means
	Mean	Std. dev.	Mean	Std. dev.	
<i>Panel A: Growth opportunities and profitability variables</i>					
Market-to-Book	2.234	1.681	3.079	2.459	-4.918
OIBD/Total Assets	0.150	0.067	0.154	0.108	-0.604
High Economic Profit Dummy (HEPD)	0.877	0.330	0.851	0.357	0.818
HEPD*ROA	0.040	0.052	0.059	0.075	-3.686
<i>Panel B: Investment policy variables</i>					
New investment	0.088	0.062	0.115	0.089	-4.373
Tangible assets	6.531	1.447	6.426	1.639	0.723
Financial slack	0.062	0.070	0.143	0.181	-10.483
<i>Panel C: Capital and organizational structure variables</i>					
Financial leverage	0.202	0.150	0.170	0.150	2.136
Geographic diversity	1.578	0.238	1.561	0.248	0.731
Scale of operations	6.720	1.387	6.371	1.691	2.502
<i>Panel D: Compensation and ownership structure variables</i>					
Bonus compensation	-0.621	0.201	-0.553	0.190	-3.389
Shares held by executives	-0.796	0.082	-0.792	0.074	-0.604

Table 4
Estimates of Logistic Prediction Model of EPP Adoptions Based on Stratified
Sample Procedure

The table reports logistic regression estimates in which the dependent variable takes the value one for the 108 EP plan adopters and zero for the 2,541 control firms. Models (1) through (4) present bootstrapped estimates from a sample of 1,000 logistic regressions. Variable definitions are described in Table A2. All Tstatistics based on bootstrapped coefficient estimates are given in parentheses; the pseudo- R^2 equals $1 - (\log\text{-likelihood at convergence}/\log\text{-likelihood at zero})$. ***, ** and * indicate that the coefficient is significant at the 0.01, 0.05, and 0.10 levels, respectively.

Independent Variable	Predicted Sign	Regression Model			
		(1)	(2)	(3)	(4)
Intercept		3.599 (9.492) ***	3.766 (3.814) ***	0.488 (0.391)	-0.385 (-0.149)
Market-to-book ratio	-	-0.425 (-4.032) ***	-	-	-0.455 (-3.857) ***
OIBD/Assets	+	1.712 (0.866)	-	-	2.457 (0.993)
High Economic Profit Dummy (HEPD)	+	0.971 (2.394) **	-	-	1.555 (2.857) ***
HEPD*ROA	-	-8.104 (-2.331) **	-	-	-9.248 (-3.041) ***
New investment	+/-	-	-4.807 (-3.346) ***	-	-2.957 (-1.332)
Tangible assets	+/-	-	-1.012 (-3.333) ***	-	-1.496 (-3.471) ***
Financial slack	+/-	-	-8.554 (-7.473) ***	-	-7.729 (-4.266) ***
Geographic diversity	+	-	1.117 (2.084) **	-	1.451 (2.083) **
Scale of operations	+	-	0.837 (2.755) ***	-	1.342 (3.231) ***
Financial leverage	+/-	-	-	1.252 (1.555)	-0.436 (-0.551)
Bonus compensation	-	-	-	-1.921 (-3.126) ***	-2.534 (-2.585) ***
Shares held by executives	-	-	-	-1.799 (-1.249)	-2.250 (-0.896)
Average pseudo R^2		0.063	0.123	0.023	0.195
Average -2 x Log-likelihood		789.76	757.14	796.70	648.21
Average % concordant observations		64.3%	67.3%	60.5%	75.4%
Rate of correct classification based on bootstrapped estimates		61.5%	62.8%	57.5%	67.7%
Bootstrapped threshold value		3.4%	3.2%	3.9%	2.9%

Table 5
Average of Median Investment, Operating Performance and Shareholder Value Measures for Control Firms
Assigned to Groupings Based on Propensity Scores

Panel A reports the average of median investment decisions, profitability, and shareholder value measures across the propensity quartiles for the control firms identified using the propensity score matching method. Variables definitions are described in Table A1. Panel B reports average z-statistics across the propensity quartiles testing the yearly equality of distributions between the EPP adopters and control firms matched by propensity scores. The significance tests are based on the Wilcoxon two-sample test.

Panel A: Control Firm Median Values														
Fiscal Year Relative to Adoption	Investment Decisions			Operating Performance									Shareholder Wealth	# of Firms
				Top Level Measures			Income Components			Asset Components				
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book	
-4	7.65%	0.00%	0.00%	-1.08%	15.20%	5.10%	-0.79%	12.70%	4.26%	1.218	6.206	4.328	1.770	1159
-3	7.46%	0.00%	0.00%	-0.30%	14.73%	4.71%	-0.10%	12.69%	4.26%	1.083	6.374	4.596	1.795	1599
-2	7.34%	0.00%	0.00%	-0.15%	14.26%	4.40%	0.05%	12.36%	3.90%	1.014	6.669	5.514	1.875	1640
-1	7.15%	0.00%	0.00%	-0.27%	14.38%	4.45%	-0.05%	12.42%	4.02%	1.035	6.797	5.959	1.930	1675
0	7.13%	0.00%	0.00%	-0.62%	14.14%	4.36%	-0.26%	12.34%	3.94%	1.039	6.713	6.012	2.034	1672
1	7.06%	0.00%	0.00%	-0.47%	14.51%	4.84%	-0.14%	12.69%	4.48%	1.042	6.753	6.059	2.113	1671
2	7.17%	0.00%	0.01%	-0.45%	14.77%	5.14%	-0.19%	13.15%	4.56%	1.037	6.769	6.138	2.218	1600
3	7.25%	0.00%	0.03%	-0.52%	14.46%	4.81%	-0.26%	13.32%	4.56%	1.030	6.690	6.135	2.165	1506
4	6.84%	0.00%	0.13%	-0.46%	14.24%	4.71%	-0.32%	13.30%	4.39%	1.002	6.650	6.069	2.103	1400

Panel B: Average (Across Propensity Groups) of Z-statistics Testing the Equality of Distributions Between EPP Adopters and Control Firms Using the Wilcoxon Two-Sample Test														
Fiscal Year Relative to Adoption	Investment Decisions			Operating Performance									Shareholder Wealth	# of Firms
				Top Level Measures			Income Components			Asset Components				
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book	
-4	0.81	0.82	0.40	1.13	1.64	1.24	0.99	0.99	0.91	0.48	0.74	0.14	0.52	1159
-3	0.81	0.89	0.55	-0.07	0.98	0.17	-0.30	0.49	-0.15	0.66	-0.13	0.35	0.03	1599
-2	0.57	0.88	-0.18	-0.88	0.56	-0.45	-0.96	0.25	-0.81	1.07	0.05	-0.25	-0.07	1640
-1	0.22	1.11	0.15	-1.05	0.57	-1.16	-0.96	0.34	-1.36	1.67	-0.20	-0.05	0.57	1675
0	0.37	1.18	-0.18	0.14	1.63	0.03	0.10	0.87	-0.15	1.99	0.27	-0.12	0.93	1672
1	0.43	1.56	0.14	0.36	0.95	-0.54	0.49	0.62	-0.71	1.91	0.18	-0.07	1.12	1671
2	0.53	1.15	-0.17	0.66	1.08	0.37	0.72	0.95	0.23	1.83	0.06	-0.07	1.13	1600
3	0.49	0.63	0.63	0.64	0.89	0.67	0.62	0.52	0.31	1.62	0.08	0.22	0.83	1506
4	0.19	0.79	0.29	0.20	0.80	0.28	0.18	0.96	0.30	1.14	0.05	-0.36	0.97	1400

Table 6
Investment, Operating Performance and Shareholder Value Measures for 72 Anticipated EPP Adopters

Panel A reports median investment decisions, operating performance, and shareholder value measures for the 72 firms that make anticipated adoptions of EPPs during 1983-1996. Variable definitions are described in Table A1. Panel B reports z-statistics testing the yearly equality of distributions between the EPP adopters and 72 surprise nonadopters matched by industry affiliation, size, and pre-adoption OIBD/assets. The significance tests are based on the Wilcoxon signed rank test.

Panel A: Anticipated EPP Adopters Median Values															
Fiscal Year Relative to Adoption	Investment Decisions			Top Level Measures			Operating Performance						Shareholder Wealth		
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book	# of Firms	
Predicted Sign	?	+	?	+	+	+	+	+	+	+	+	+	+		
-4	9.27%	0.00%	0.00%	-0.43%	17.72%	6.04%	-0.30%	12.23%	4.03%	1.413	7.447	3.919	1.656	49	
-3	8.37%	0.01%	0.00%	-0.81%	15.95%	4.95%	-0.55%	12.23%	3.38%	1.241	6.312	5.509	1.624	69	
-2	7.17%	0.00%	0.00%	-1.25%	14.61%	4.39%	-1.00%	11.26%	2.75%	1.267	6.791	5.551	1.677	72	
-1	6.68%	0.01%	0.00%	-1.11%	14.61%	3.48%	-0.73%	11.30%	2.27%	1.342	6.749	5.704	1.767	72	
0	7.27%	0.06%	0.00%	-0.95%	15.91%	3.71%	-0.59%	11.24%	2.51%	1.345	7.032	6.053	1.882	72	
1	7.98%	0.06%	0.00%	0.01%	15.23%	3.16%	0.00%	11.16%	2.14%	1.337	7.013	6.190	2.244	72	
2	7.98%	0.01%	0.00%	-0.64%	16.45%	5.55%	-0.31%	12.36%	3.88%	1.395	6.664	6.276	2.374	72	
3	7.47%	0.04%	0.29%	-0.56%	16.09%	5.62%	-0.38%	12.33%	3.82%	1.305	6.717	6.738	2.315	66	
4	6.79%	0.02%	0.33%	-1.46%	15.69%	5.58%	-0.85%	12.03%	4.00%	1.322	6.770	6.242	2.410	58	

Panel B: Z-Statistics Testing the Yearly Equality of Distributions Between Anticipated EPP Adopters and Matching Surprise Nonadopters Using the Wilcoxon Matched-Pairs Signed-Ranks Test															
Fiscal Year Relative to Adoption	Investment Decisions			Top Level Measures			Operating Performance						Shareholder Wealth		
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book	# of Firms	
-4	0.32	-0.84	0.66	1.60	2.67	1.15	1.59	1.01	0.46	1.04	1.46	0.68	0.46	50	
-3	0.20	0.18	0.74	0.01	1.36	-0.45	0.07	-0.23	-1.24	0.57	0.82	2.12	-0.08	69	
-2	-0.70	0.48	0.75	-0.74	0.15	-0.89	-0.50	-0.71	-1.46	-0.46	1.23	0.53	-0.36	72	
-1	-1.30	0.79	1.00	-0.91	0.35	-1.91	-0.68	-0.64	-2.41	0.79	1.07	1.44	-0.75	72	
0	-0.33	1.29	-1.28	1.28	3.25	0.20	1.62	0.34	-0.41	1.63	1.44	1.62	1.15	72	
1	0.72	2.85	-0.45	1.00	1.35	-1.78	1.17	-0.62	-2.64	1.66	1.07	1.79	1.43	72	
2	0.73	2.41	-0.70	1.12	2.11	1.07	1.46	0.80	0.49	1.34	1.02	1.47	2.10	72	
3	0.40	1.71	0.34	1.75	1.56	1.93	1.76	-0.01	0.80	0.87	1.14	1.94	0.98	66	
4	0.52	-2.27	0.00	-0.34	-1.01	-0.94	-0.21	-0.84	-0.58	-0.18	-1.05	-1.75	-0.79	58	

Table 7
Investment, Operating Performance and Shareholder Value Measures for 36 Surprise EPP Adopters

Panel A reports median investment decisions, operating performance, and shareholder value measures for the 36 firms that make “surprise” adoptions of EPPs during 1983-1996. Variable definitions are described in Table A1. Panel B reports z-statistics testing the yearly equality of distributions between the 36 surprise EPP adopters and 36 anticipated nonadopters matched by industry affiliation, size, and pre-adoption OIBD/assets. The significance tests are based on the Wilcoxon signed rank test.

Panel A: Surprise EPP Adopters Median Values														
Fiscal Year Relative to Adoption	Investment Decisions			Top Level Measures			Operating Performance						Shareholder	# of Firms
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	Income Components			Asset Components			Wealth	
							EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book	
-4	9.39%	0.07%	0.00%	0.23%	17.95%	6.91%	0.13%	18.23%	6.78%	1.046	4.951	3.975	2.145	28
-3	9.48%	0.00%	0.00%	0.83%	17.23%	7.10%	1.01%	16.00%	5.30%	1.097	5.745	3.912	1.878	35
-2	9.08%	0.00%	0.00%	-0.31%	14.80%	4.63%	-0.25%	15.81%	4.11%	0.975	5.610	3.972	1.967	35
-1	8.25%	0.00%	0.00%	0.11%	15.31%	4.68%	-0.02%	17.42%	4.47%	1.069	6.409	4.284	2.483	36
0	7.73%	0.00%	0.00%	0.33%	18.06%	6.57%	0.44%	18.25%	6.37%	1.183	6.184	4.563	2.798	36
1	6.31%	0.00%	0.02%	1.05%	17.42%	6.95%	0.73%	18.83%	6.65%	1.039	6.613	4.804	2.557	36
2	8.53%	0.00%	0.26%	-0.09%	17.21%	5.24%	-0.13%	18.58%	5.64%	0.949	6.506	4.765	2.592	35
3	6.45%	0.00%	0.00%	0.11%	15.27%	5.58%	0.09%	18.76%	6.25%	0.945	6.204	5.162	3.067	33
4	7.15%	0.00%	0.00%	-1.05%	14.03%	3.90%	-1.40%	17.96%	3.96%	0.847	6.087	4.359	2.736	30

Panel B: Z-Statistics Testing the Yearly Equality of Distributions Between Surprise EPP Adopters and Matching Anticipated Nonadopters Using the Wilcoxon Matched-Pairs Signed-Ranks Test														
Fiscal Year Relative to Adoption	Investment Decisions			Top Level Measures			Operating Performance						Shareholder	# of Firms
	New Investment	Disposals/ Assets	Acquisitions/ Assets	EP/ Assets	OIBD/ Assets	ROA	Income Components			Asset Components			Wealth	
							EP Margin	OIBD Margin	Profit Margin	Asset Turnover	A/R Turnover	Inventory Turnover	Market- to-Book	
-4	-0.71	1.85	-1.31	1.27	0.92	0.24	1.04	0.38	0.07	0.65	0.47	1.23	0.26	28
-3	-1.09	0.09	-1.77	0.82	0.31	-0.03	0.57	-0.34	-0.50	0.15	-0.34	0.10	-0.04	35
-2	-0.39	0.36	-1.58	0.04	-0.70	-1.24	-0.19	-1.09	-1.64	-0.15	-0.28	-0.32	-1.14	35
-1	-0.88	-0.32	-0.04	0.26	-0.67	-0.69	-0.01	-0.43	-0.80	0.12	-0.36	-0.18	-0.30	36
0	-1.64	0.28	-0.85	-0.72	-0.03	-0.92	-1.14	-0.44	-1.35	0.55	0.05	-0.26	0.51	36
1	-1.25	0.13	-0.71	0.49	0.47	-0.20	0.48	0.58	-0.57	0.62	0.60	-0.01	-0.01	36
2	-1.10	0.23	0.51	-0.09	-1.18	-0.81	-0.13	-0.31	-1.42	-0.11	-0.11	0.00	-0.54	35
3	-1.52	-0.24	-0.19	0.15	-0.98	-1.15	0.10	-0.07	-1.82	0.03	-0.19	0.14	-0.59	33
4	-1.67	-0.64	-0.97	-0.61	-1.55	-1.49	-0.77	-0.86	-1.41	-1.03	-0.64	-0.86	-1.18	30