STOCK PRICE INFORMATIVENESS AND CORPORATE SPINOFFS

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ABSTRACT

YOUNGSUK YOOK: Stock Price Informativeness and Corporate Spinoffs
(Under the direction of Paolo Fulghieri)

This paper empirically investigates the role of stock price informativeness in the real sector using a sample of corporate spinoffs from 1975 to 2001. In the first part, I examine the impact of stock price informativeness on a firm's managerial decisions and operating performance. I find that changes in informativeness around the spinoff are positively related to the subsequent changes in operating performance of the parent firms. Those firms with increased informativeness make significant adjustments to improve investment efficiency following the spinoff. The results suggest that managerial investment decisions serve as one of the channels through which informed trading in the market contributes to firm performance. In the second part, I examine the changes in CEO compensation structure around the spinoff and investigate how it relates to stock price informativeness and operating performance. I find that firms increase the proportion of stock-based compensation significantly following spinoffs. These changes in stock-based compensation are positively associated with changes in subsequent firm performance, suggesting that stock-based compensation is an effective tool in structuring managerial incentives. I also find that informativeness-performance association stays positive and significant, controlling for the change in compensation structure around the spinoff. In sum, my findings provide support for the view that informed trading matters to the real sector.

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CHAPTER I

INTRODUCTION

This paper empirically investigates the role of stock price informativeness in the real sector using a sample of corporate spinoffs from 1975 to 2001. The paper consists of two parts. In the first part, I examine the impact of stock price informativeness on a firm's managerial decisions and operating performance. In the second part, I study the structural changes in CEO compensation around the spinoff and examine how compensation structure relates to the association between stock price informativeness and operating performance established in the first part.

The finance literature suggests that the information contents of stock price impact the real sector through the channel of managerial decisions. The stock price provides information feedback to the managers, leading to better management decisions.[1] Understanding how much the markets know about their firm, the managers have reasonable expectation about their firm's stock price movements. Therefore, when they observe unexpected trading activities, the managers can deduce the information contents. Alternatively, the stock price allows for an incentive contract subject to the market monitoring. Holmstrom and Tirole (1993, p.678) state that "the stock price incorporates performance information that cannot be

[1] Boot and Thakor (1997), in comparing the role of the financial markets and that of a bank, argue that financial markets have information feedback, which affect the real decisions. Subrahmanyam and Titman (1999), while examining the choice between private and public financing, suggest that the benefit of going public is a more informative stock price, which can lead to better management decisions. Habib, Johnsen, and Naik (1997) and Chang and Yu (2004) propose that corporate spinoffs facilitate more informative stock price, which helps managers improve their investment decisions.

extracted from the firm's current or future profit data. The additional information is useful for structuring managerial incentives."

I empirically investigate this proposed connection between informativeness of stock price and the real sector. Specifically, I measure the change in stock price informativeness over time and examine how it relates to the firm's managerial decisions and subsequent performance (the construction of informativeness measures is described in the next chapter.) The stock price informativeness of a firm does not vary considerably over time.[2] Therefore, my goal is to find a corporate event that drastically changes informativeness of stock prices. Corporate spinoffs provide a natural experiment for this study because the changes in informativeness around the spinoff are well supported theoretically and empirically.[3] Chang and Yu (2004) and Goldman (2005) theoretically demonstrate that firms that choose to spin off meet with an increase in information production. Huson and MacKinnon (2003) report significantly more intensive informed trading and higher transaction costs after spinoffs.

Using a sample of corporate spinoffs, I first test the hypothesis that changes in informativeness around the spinoffs are positively associated with subsequent changes in the operating performance of parent firms. The regressions analysis provides support for the hypothesis. The results indicate that mean change in informativeness is positive and significant, and is associated with an increase of 0.73 to 1.65% in industry-adjusted operating performance. For a firm with an average industry-adjusted operating performance, this means

[2] I estimated a measure of stock price informativeness for entire CRSP firms from 1991 to 1999 using daily stock prices. The year-to-year changes in informativeness were roughly one tenth of the changes around the spinoff in magnitude, excluding year 1998 when it had a spike.

[3] One might argue that the top 5% of all firms in the U.S. stock market in terms of changes in informativeness would provide data with same characteristics as spinoffs. However, the changes in informativeness of those firms are likely to have been caused by some unique events such as spinoffs, carve-outs, or takeovers, as typical firms do not demonstrate significant changes in informativeness. Choosing one specific type of an event allows applying proper robust checks than dealing with the set of firms associated with different corporate events.

an increase in the industry-adjusted performance from 3.78% in the first year following the spinoff to 4.51 to 5.43% in the second or the third year.

Next, I examine the managerial channel through which the informative stock price impacts firm performance. In particular, I examine whether the additional information in the stock price facilitates more efficient investment decisions. According to the Q theory, firms should invest more (less) as investment opportunities increase (decrease). In other words, investment efficiency is evaluated by assessing the alignment between a firm's investment opportunity and its level of actual investment. I consider a firm over-investing (under-investing) if it invests more (less) than its industry when it has less (more) investment opportunities relative to its industry. I find that, among the firms suffering from an overinvestment or underinvestment problem prior to the spinoff, those firms with increased informativeness make significant adjustments to resolve investment inefficiency after the spinoff. This suggests that increased informed trading activities induce the managers to make better investment decisions, which appear to, at least partially, account for the improved operating performance.

Spinoffs are not a random subsample of the population of firms. Therefore, I implement a number of robustness checks to address potential problems that can be caused by the characteristics of the data. On a general level, I adopt the Heckman's two-stage estimation procedure (Heckman (1979)) for the test of sample selection bias. On a microscopic level, I examine specific alternative hypotheses that may explain the performance changes around the spinoff. The corporate focus hypothesis proposes that focus-improving firms achieve better operating performance after the spinoff by getting rid of unrelated divisions and concentrating on the division for which managerial skills and resources are well-suited. The

removal of poorly performing subsidiaries may explain the performance improvement of the parents subsequent to the spinoff, which I call the subsidiary performance hypothesis. The internal capital market hypothesis suggests that capital allocation is improved by dismantling internal capital markets via spinoffs. Collectively, the results indicates that the main findings still holds, accounting for the alternative explanations.

The investigation so far has focused on the impact of stock price informativeness in the real sector. In the second part of the study, I extend the boundary of my investigation to include the structural change in CEO compensation around the spinoff. Major corporate restructuring often involves changes in managerial compensation structure, leaving CEO with a different incentive. Therefore, it is only natural to analyze whether potential change in compensation structure around the spinoff affects subsequent operating performance.

Using the same sample of corporate spinoffs featured in the first part, I first test whether firms change CEOs' compensation structure, more specifically the proportion of stock-based compensation, following spinoffs. I find that stock-based compensation increases significantly subsequent to spinoffs. This is an intuitive result for the following reasons. First, more informative stock price subsequent to spinoffs may encourage firms to further engage in stock-based compensation. Second, the post-spinoff stock price follows the division performance more closely, making stock-based compensation a more effective tool to align CEO's incentives

I further investigate whether stock-based compensation is an effective tool to structure managers' incentive by examining the association between changes in stock-based compensation and changes in subsequent performance. I find that changes in the proportion of stock-based compensation are positively related to the changes in subsequent firm

performance. As a robustness check, I introduce alternative measures such as the proportion of CEO wealth tied to the stock performance to complement the measure of stock-based compensation. However, the additional measures do not demonstrate any significant association with the subsequent firm performance.

Finally, I examine whether managers are more inclined to study the stock price and improve the performance when firms provide more stock-based compensation. One way to analyze this is to test a hypothesis that changes in informativeness around the spinoff and subsequent changes in performance have a stronger association when a greater proportion of CEO compensation is tied to stock performance. The results are not consistent with the hypothesis. The interaction term between informativeness and compensation is virtually insignificant. It appears that more performance-sensitive compensation helps induce CEOs to exert more effort, but the process does not necessary involve the channel of the stock prices.

This paper is among the first studies on the role of information in the real sector. Related papers include Durnev, Morck, and Yeung (2004) and Chen, Goldstein, and Jiang (2005). Durnev, Morck, and Yeung find a positive association between investment efficiency and stock price informativeness. However, their study differs from this paper in that their objective is to evaluate firm-specific return variation as an informativeness measure. In contrast, Chen, Goldstein, and Jiang share the goals of the present study, but they focus on investment sensitivity to stock price, whereas I start by examining operating performance and consider investment decisions as one of the managerial decisions contributing operating performance. Unlike the two papers, which examine the level of informativeness of a firm, my paper explicitly measures the changes in informativeness over time and analyzes its impact. This approach allows for a comparison of the operating performance of the same

firm at two different levels of informativeness. Consequently, if firms with a higher level of informed trading were different in some ways from those with a lower level of informed trading, this approach would still produce unbiased results. The difference in methodology leads to the difference in data. While the two papers use all firms available on CRSP and COMPUSTAT, I utilize a sample of corporate spinoffs and take an event-study approach.

The remainder of this paper is organized as follows. Section 2 describes the measures of informativeness, operating performance, and compensation structure. Section 3 describes the data and reports summary statistics. Section 4 investigates how stock price informativeness relates to the firm's managerial investment decisions and operating performance. Section 5 studies the structural change in CEO compensation and analyzes its impact on firm performance. Section 6 concludes.

CHAPTER II

RESEARCH DESIGN

2.1 Measures of stock price informativeness

In order to evaluate the impact of stock price informativeness, I first need to construct the measures of informativeness. Three informativeness measures are employed to gauge the changes in informativeness of stock price of a firm around the spinoff. First, two firm-specific return variation measures are calculated using daily stock prices: return variation unexplained by market return, which I call firm-specific return variation (MM), and return variation unexplained by market return and industry return, which I call firm-specific return variation (MI). These measures are obtained by regressing firm returns on market return (and industry return) and calculating the standard deviation of the regression residuals, where both market return and industry return are value-weighted. Industry is defined as all firms (excluding the sample firm) that have the same 3-digit SIC code as the sample firm.

These measures are based on a relatively recent stream of studies, which suggest that higher firm-specific return variation indicates increased private information in stock prices. Roll (1988, p. 566) first proposes that the return variation unexplained by market return and industry return seems to imply "the existence of either private information or else occasional frenzy unrelated to concrete information." He adds that publicly available information events do not explain this unsystematic return variation. Following up on Roll (1988), Durnev et al. (2003, p.798) state that "the relative importance of the two preceding views is an empirical

question." They show that firms with higher firm-specific return variation exhibit a stronger association between current returns and future earnings, which they conclude supports Roll's former interpretation that greater idiosyncratic variation implies more private information. Morck, Yeung, and Yu (2000) report greater firm-specific return variation in countries with better investor protection and suggest that strong property rights promote informed arbitrage, leading to the impounding of more firm-specific information. In addition, Durnev, Morck, and Yeung (2004) document that U.S. industries and firms exhibiting larger firm-specific return variation make more value-enhancing capital budgeting decisions. In the spinoff literature, Huson and MacKinnon (2003) use the return variation unexplained by market return to estimate the changes in informativeness around the spinoff. Their findings using the return variation measure are consistent with those using the measures based on intraday transactions data.

The last measure of informativeness is the relative effective bid-ask spread (REBA). The REBA is calculated as two times the absolute difference between the transaction price and the midpoint of the quoted bid and ask outstanding at the time of the trade, divided by the quote midpoint. To calculate the REBA, trades and quotes data from 1993 to 2001 are obtained from the NYSE Trades and Quotes (TAQ) database. In addition, trades and quotes data covering the NYSE and AMEX between 1983 and 1992 are obtained from the Institute for the Study of Security Markets (ISSM). The REBA is expected to be higher when there is more private information in the markets. It is a well established informativeness measure in the market microstructure literature. Glosten and Milgrom (1985) propose that a bid-ask spread is a function of the informational differences between insiders and the rest of the markets. A number of empirical studies utilize the bid-ask spread as an informativeness

measure. For example, Venkatesh and Chiang (1986), in measuring information asymmetry prior to earnings and dividend announcements, use the bid-ask spread as a proxy for information asymmetry. Howe and Lin (1992) study the relationship between dividend yield and the level of information asymmetry, which they capture by the bid-ask spread.

For all three informativeness measures, changes in informativeness capture the changes in the degree of informativeness from the pre-spinoff to the post-spinoff period. The pre-spinoff period is defined as the 250 trading days ending 50 days prior to the first public announcement of a spinoff. The post-spinoff period is defined as the 250 days beginning 50 days after the date of a spinoff distribution. For estimation purposes, I exclude the period between the announcement date and the distribution date. As a robustness check, shorter time period is applied: 40 days prior to the spinoff announcement for the "pre-spinoff" period and 60 days after the spinoff distribution for the "post-spinoff" period. The qualitative results are same as those with 250 days as the estimation period and not reported here.

2.2 Measures of operating performance

Following Desai and Jain (1999), I use industry-adjusted return on assets (ROA) as the measure of operating performance. Industry-adjusted ROA is defined as ROA of a sample firm minus ROA of its matching firm. For each sample firm, I select one matching firm that has the same four-digit SIC code as the sample firm and is closest to it in size in the month of the spinoff distribution. Desai and Jain report performance improvement for focus-improving firms subsequent to the spinoff. By employing Desai and Jain's performance measure and making my performance measure comparable to theirs, I can test whether the performance

changes associated with changes in informativeness are, in fact, attributed to focus improvement.

Changes in operating performance are defined as ROA in the second or the third year minus ROA in the first year following the spinoff. Changes in informativeness around the spinoff are matched with changes in operating performance in the second or the third year relative to the first fiscal year after the spinoff. The detailed timeline is illustrated in figure 1. Performance changes in this period provide a cleaner measure than those contemporaneous to changes in informativeness for two reasons. First, operating performance is expected to exhibit a delayed response to managers' decisions that reflect the additional information feedback from stock prices following the spinoff. Secondly, according to Desai and Jain, most of the improvement in performance attributable to corporate focus is realized by the first year after the spinoff. In that regard, measuring the performance staring after the spinoff allows a less noisy link between changes in informativeness and changes in performance.

2.3 Measures of compensation structure

In this subsection, two measures of compensation structure are developed for the tests in the second part. First, stock-based compensation (SBC hereafter) is defined as the ratio of the sum of restricted stock grants and option grants to total compensation.[4] SBC directly compensates CEOs for strong stock performance of the firm. Therefore it is an effective tool to induce CEOs to study information contents of stock prices if more informative stock prices can help managers with their managerial decisions. Pre-spinoff (post-spinoff) SBC is the

[4] Total compensation is the sum of salary, bonus, restricted stock grant, option grant, long-term incentive payouts, and all other payments.

average of year -4 through year 0 (year +1 through year +3). Change in SBC is post-spinoff SBC minus pre-spinoff SBC.

While stock-based compensation is the direct measure of CEO incentive linked to the firm's stock performance, sometimes alternative compensation schemes, though indirect, are implemented. Some firms reward CEO for his performance with bonus or by increasing future salary permanently. Garvey and Swan (2002) report that accounting-based bonus incentives are employed more by illiquid firms as a substitute to stock-based compensation. Therefore, I adopt Jensen and Murphy (1990)'s methodology and calculate pay-performance sensitivity (delta, hereafter) to measure how responsive CEO's total compensation is to change in stock performance. Delta is defined as the estimated value of *b,* the coefficient of the following regression:

$$\Delta \text{ (CEO total compensation)}_t = a + b \cdot \Delta \text{ (shareholder wealth)}_t.$$

The change in shareholder wealth variable is defined as $r_t \cdot V_{t-1}$, where r_t is the inflation-adjusted rate of return on common stock realized in fiscal year *t*, and V_{t-1} is the firm value at the end of the previous year. Delta reflects how responsive CEO's total compensation is to the changes in the stock performance of the firm. Pre-spinoff (post-spinoff) delta is calculated by estimating the above equation using observations between year -4 and 0 (year +1 and year +3). The change in delta around the spinoff is post-spinoff delta minus pre-spinoff delta.

CHAPTER III

DATA DESCRIPTION

3.1 Spinoff data

The spinoff sample in this study covers the firms that completed spinoffs between 1975 and 2001. The sample ends in 2001 because the tests require operating performance data for three years after spinoff distributions. The data used in Desai and Jain (1999) covering 155 spinoffs between 1975 and 1991 are used in this study.[5] Data from 1992 to 2001 are gathered from two sources: the Center for Research in Security Prices (CRSP) tapes, which assign distribution codes of 3762, 3763, and 3764 to spinoff firms and Security Data Company (SDC), which identifies spinoff cases based on news articles.[6] I then use news articles in Factiva to verify the spinoffs and identify their announcement dates and effective dates of distribution. This step yields a sample of 379 spinoffs between 1992 and 2001.

To remain in my sample, a spinoff has to satisfy the following criteria[7]: (1) CRSP data for the parent firm are available for one year before the spinoff announcement and after the spinoff distribution; (2) COMPUSTAT data for the parent are available for at least two years after the spinoff; (3) the subsidiary starts trading publicly after the spinoff announcement is

[5] I am extremely grateful to Hemang Desai for making his data available to me. See Desai and Jain (1999) for details regarding their data selection criteria.

[6] Distribution code 3763 refers to nontaxable spinoffs. Code 3762 refers to spinoffs taxable at the same rate as dividends, and 3764 refers to spinoffs taxable at the same rate as capital gains.

[7] The data selection criteria include the criteria applied by Desai and Jain to ensure the consistency between the later-period sample (1992-2001) and the sample used in Desai and Jain (1975-1991).

made; (4) the parent's SIC code is not between 6000 and 6500; (5) the parent is not simultaneously engaged in mergers or acquisitions; (6) the spinoff is a nontaxable transaction; and, (7) real estate investment trusts (REITs) and tracking stocks are excluded from the sample.

Based on these criteria, I drop 85 spinoffs from the sample because the parent firm does not have CRSP data for the required time period and 108 spinoffs because COMPUSTAT data are not available for the required period. Fifteen spinoffs are excluded in which subsidiaries start trading publicly before the spinoff announcements are made; for such firms, some of the informational benefit of spinoffs may be realized before the spinoffs are undertaken. Thus, they should be treated differently from the rest of the spinoffs. Nineteen spinoffs with SIC codes between 6000 and 6500 are removed. Also, six parents engaged in mergers or acquisitions simultaneously are eliminated. Mergers and acquisitions have an opposite effect to that of spinoffs in terms of stock price informativeness; thus, any impact of a spinoff on informed trading might be offset by that of a merger or an acquisition. I consult the Commerce Clearing House's Capital Changes Reporter to determine the tax status of the spinoffs and eliminate 27 taxable spinoffs. One REIT and 5 tracking stocks are excluded. The final sample consists of 268 parents and 287 subsidiaries.

3.2 CEO Compensation Data

CEO compensation data are collected for the firms in the spinoff data featured in the first essay. For each firm, the compensation data are collected from year -4 to year +3, where year 0 is the year of spinoff distribution. The data include total 219 firms, spanning 7.2 years per firm on average. The data between 1992 and 2001 are acquired from ExecuComp. The data

prior to 1992 are obtained from the firms' annual proxy statements. The record of the Security and Exchange Commission (SEC) filing goes back to as early as 1978. In 1992 the SEC began requiring that firms must disclose detailed information on executive compensation in their proxy statements including salary, bonus, stock options, restricted stock, and long-term incentive payouts. Without such requirement, pre-1992 proxy statements typically disclose only option grants in addition to the total compensation. Estimated values of restricted stock grants are included in total compensation.

3.3 Summary statistics

Table 1 reports the distribution of spinoffs by effective date of distribution and three summary statistics for parent firms. Market value of a parent is measured at the end of the month of the spinoff distribution. Spinoffs are distributed without humps over the sample period although the frequency of spinoffs is in an increasing trend over time. The sample firms are spread across industries, covering 47 2-digit SIC codes (not reported). The mean (median) market value of parent firms is $4,222.07 million ($580.31 million). The mean (median) value of total assets of parent firms is $5,177.72 million ($840.70 million).[8] Total assets are the value at the end of first fiscal year after the spinoff distribution. Parent firms constitute 76% (median) of the combined firms in terms of total assets in the first fiscal year after the spinoff.

Panel A of table 2 tabulates changes in stock price informativeness around the spinoff for the three informativeness measures: firm-specific return variation (MM), firm-specific return variation (MI), and REBA. All three measures indicate that parent firms' prices become significantly more informative after the spinoff, consistent with Huson and MacKinnon

[8] Market value and total assets are reported in 1995 dollars.

(2003). The mean (median) change from the pre-spinoff to the post-spinoff period for the firm-specific return variation (MM) measure is 0.0036 (0.0026), which represents an increase of roughly 15% (12%) over the pre-spinoff period and is significantly different from zero at the 1% level. Similarly, the firm-specific return variation (MI) measure increases by 15% (12%). This is not surprising considering that the correlation coefficient between the two measures is .997 (table 2, panel B). The REBA, as the measure based on intraday transactions data, displays a similar pattern, but with a different magnitude. The REBA has 25% and 26% correlation with the two firm-specific return variation measures, respectively, both of which are significant at the 1% level. The mean (median) change in the REBA around the spinoff is 0.0042 (0.0010), which represents approximately a 32% (14%) increase from the pre-spinoff to the post-spinoff period and is significantly different from zero at the 1% level. These increased trading costs measured by the relative effective bid-ask spread indicate that there is more informed trading following the spinoff. One implicit assumption made here as well as in Huson and MacKinnon is that pre-spinoff combined-firm stock prices are a good proxy for information production on the parent firm. As the parent constitutes about 76% of the combined firm, information production prior to the spinoff is likely to be concentrated on the parent firm, leading to the impounding of more private information regarding the parent in stock prices.

In panel C of table 2, I report raw ROA and industry-adjusted ROA of parent firms from year +1 to year +3, where year 0 is defined as the year of a spinoff distribution. Raw ROA does not vary considerably over time. The mean (median) raw ROA in years +1, +2, and +3 are 0.1297 (0.1321), 0.1326 (0.1362), and 0.1238 (0.1243), respectively. Sample firms outperform their matching firms throughout the testing period of the three years. The mean

(median) industry-adjusted ROA in years +1, +2, and +3 are 0.03781 (0.0150), 0.0551 (0.0211), and 0.0592 (0.0187), respectively, all of which are significantly different from zero at the 1% level. The results indicate that raw ROA increases (decreases) by 0.0029 (−0.0059) in the second (third) year relative to the first year while industry-adjusted ROA increases 0.0173 (0.0214) in the second (third) year. Evidently, changes in industry-adjusted ROA are more pronounced than changes in raw ROA, consistent with Desai and Jain. It also suggests that industry-adjusted ROA controls for the fluctuations caused by different industry characteristics.

Table 3 tabulates CEO compensation and stock holdings. The results are also depicted in figure 3. Figure 3A shows the median trend of total compensation and stock-based compensation by year (all compensation measures are converted to 1995 dollar value). Stock-based compensation is defined as the sum of restricted stock grants and option grants. Both total compensation and stock-based compensation increase over time. Compensation data demonstrate a strong right skewness. Therefore, the analysis throughout the paper concentrates on the median values, unless specified otherwise. The median total compensation (stock-based compensation) is as low as $188,150 ($0) in 1977 and reaches its peak of $5,076,680 ($2,819,900) in 2000. Overall, stock-based compensation increases in proportion to total compensation.

Figure 3B shows percentage of firms utilizing stock-based compensation and option grant per year. Increasing number of firms adopt stock-based compensation over time. While as little as 15% of the firms provide stock-based compensation in late 1970s, over 80% of the firms make stock-based payments in 2000s. Throughout the entire sample period, the majority of stock-based compensation is in the form of option grants rather than restricted

stock grant as shown in the figure 3B. During the post-1991 period, where all firms report restricted stock grants separately, only 24% of the firms use restricted stock grants on average, whereas 76% of the firms use stock grant. The frequency of usage of option and stock grant is consistent with previous findings.[9] Figure 3C indicates that the stock-based compensation is concentrated on option grants in terms of dollar amounts as well: only 4% (6%) of total compensation constitutes restricted stock grants whereas 25% (36%) of the total compensation comprises option grants for the entire sample period (the post-1991 period). One possible reason why firms prefer granting options to granting restricted stocks may be that, unlike stock options whose payoffs function is convex in stock price, restricted stock creates a linear payoff schedule because of the zero exercise price.[10] Thus, risk-averse CEOs who receive restricted stock bear the potential wealth loss from risky investment projects. Therefore, higher restricted stock grants are likely to induce CEOs to forego value-increasing risky projects.

Table 4 reports summary statistics for the measures of CEO compensation structure. Mean (median) pre-spinoff SBC is approximately 26% (24%) and mean (median) post-spinoff SBC is roughly 30% (28%). SBC increases by mean (median) of 4.3% (1.3%) around the spinoff, which is significant at the 1% level. Two possible explanations are following. First, more informative stock price subsequent to spinoff encourages firms to increase stock-based compensation. Tirole and Holmstrom (1992) propose that additional information in the stock price is useful in structuring CEO incentives, which is empirically supported by Garvey and

[9] Murphy (1999) reports that 62.7% of his sample firms granted options in 1992. Bryan, Hwang, and Lilien (2000) report that the percentage of firms granting stock options range between 53.92 and 71.85 during the five year period between 1992 and 1997 while the percentage of firms granting restricted stock varies between 18.96 and 21.17 during the same period.

[10] Ofek and Yermack (1997) propose that restricted stock grant can be viewed as an option with a zero strike price.

Swan (2002). Second, firms provide CEOs with more SBC following spinoffs as post-spinoff stock prices follow more closely the performance of the division of which CEOs are in charge. The change in firm size around the spinoff is not expected to affect the change in stock-based compensation at the significant level. Garvey and Swan document a correlation coefficient of 0.05 between stock-based pay and firm size (measured by total assets) using cross-sectional data. Considering that firm size, on average, decreases following spinoffs, the pure magnitude of an increase in stock-based compensation reported in this study is a rather conservative statement.

Median pre-spinoff delta is 0.00001 and post-spinoff SBC is 0.00019. Due to the missing data, change in delta around the spinoff is -0.00001, a negative value, which means that CEO compensation became less sensitive to the firm's stock performance by 1 cent per each $1000 change. The change is small and statistically insignificant. Unlike Jensen and Murphy (1990), where one value of delta fitting all firms in the sample is estimated, my study requires an individual delta for each firm, which results in a small sample size for estimation. For each firm, the number of observation available for regression ranges between 2 and 4. Therefore, I should point out that delta is relatively less reliable measure among the four measures.

CHAPTER IV

EMPIRICAL RESULTS – PART I

Empirical results for the first part of the study are detailed in this chapter. I first test the association between stock price informativeness and operating performance. Then, I examine whether managerial investment decisions serves as a channel linking informativeness and performance. Finally, I implement a number of robustness checks to address potential problems caused by the characteristics of the data.

4.1 Price informativeness and operating performance

In this section, I test the hypothesis that changes in stock price informativeness around the spinoff are positively related to subsequent changes in operating performance of the parents. I estimate the following equation:

$$\Delta ROA_i(+1,t) = \beta_0 + \beta_1 \cdot \Delta Info_i(-1,+1) + \beta_2 \cdot X_i + \varepsilon_i ,$$

where $\Delta ROA_i(+1,\ t)$ is the proxy for changes in operating performance of parent firms and is obtained by measuring industry-adjusted changes in return on assets from the first fiscal year after the spinoff to the second year ($t = 2$) or the third year ($t = 3$). $\Delta Info_i(-1,+1)$ is the change in informativeness of stock prices of parent firms from the pre-spinoff to the post-

spinoff period. Informativeness is measured by each of the three informativeness measures described in section II. For all regressions, the main variables, informativeness and operating performance, are trimmed at the 1 % level to prevent outliers from influencing the results. X_i is a set of control variables. For all regressions, I control for the pre-spinoff level of informativeness, changes in beta, changes in leverage, size, and 3-day excess return around spinoff announcements. In addition, changes in systematic stock return variations as well as the pre-spinoff systematic return variations are used as control variables when the firm-specific return variation measures are utilized as the informativeness measure. The construction of the control variables is detailed in the Appendix. Changes in beta and changes in leverage measure changes from year –1 to year +1, comparable to changes in information measures. For the hypothesis to hold, β_1 must be greater than zero.

The regressions in table 5 yield a univariate analysis using each of the three informativeness measures. The first three regressions use changes in industry-adjusted ROA from year +1 to +2 as the dependent variable. All three regressions show the significant and positive relationship between changes in informativeness around the spinoff and subsequent changes in operating performance, consistent with the hypothesis. The coefficients of the three informativeness measures range between 2.00 and 2.56, indicating that mean level of change in informativeness is associated with an increase of 0.84 to 0.92% in industry-adjusted operating performance. For a firm with the mean level of industry-adjusted operating performance, this means an increase in the industry-adjusted performance from 3.78% in the first year following the spinoff to 4.62 to 4.7% in the second year.

The next three regressions use changes in industry-adjusted ROA from year +1 to +3 as the dependent variable. The coefficients of the informativeness measures remain positive and

significant. The magnitude of the two firm-specific return measures is stronger, while that of the REBA is slightly weaker than in the first three regressions. For all three informativeness measures, the statistical significance is higher than in the first three regressions, with two measures significant at the 5% level. It suggests that the informativeness measures are more predictive of long-run performance. This informativeness-performance association is well depicted in Figure 2. Sample firms are sorted into four quartiles based on the magnitude of changes in informativeness around the spinoff, with quartile 1 corresponding to the firms experiencing the least improvement in informativeness. Firms in quartile 1 display the least improvement in operating performance, whereas those in quartile 4 demonstrate the most improvement.

The results of multivariate regressions (table 6) are consistent with those of the univariate analysis. For all three informativeness measures, statistical significance is improved after control variables are introduced. The informativeness variables are significant at the 5% level for all six regressions. The coefficients of the two firm-specific return variation measures are 3.8634 and 4.7583, much higher than those in the univariate regressions. This indicates that mean level of change in informativeness is associated with an increase of 0.73 to 1.65% in industry-adjusted operating performance. For a firm with the mean level of industry-adjusted operating performance, this means an increase in the industry-adjusted performance from 3.78% in the first year following the spinoff to 4.51 to 5.43% in the second or the third year.

None of the control variables are consistently significant throughout the six regressions. The coefficient on the changes in systematic variation variable is negative throughout all four regressions using the firm-specific return variations as informativeness measures and statistically significant in regression 2. This can be interpreted to suggest that more informed

trading activities after the spinoff seem to transmit more private information regarding the industry and overall markets, decreasing the systematic portion of the return variation. The pre-spinoff level of unsystematic and systematic variations does not explain the changes in performance at a significant level. Changes in beta are positively related to changes in performance throughout all six regressions. Especially, they are statistically significant at the 5% level when the REBA is used as the informativeness measure (regressions 3 and 6). Beta represents the sensitivity of a firm to macroeconomic changes. Those firms that become more sensitive to macroeconomic factors seem to improve the performance more. According to Chang and Yu (2005), more volatile firms benefit more from information production in the market. The changes in leverage and size variables are largely insignificant throughout all regressions. The coefficients of 3-day excess return around the spinoff announcement are insignificantly different from zero except in regression 6. Overall, the excess return variable appears to explain the performance changes in the third year relative to the first year better than the changes in the second year, suggesting that markets have some predictive power regarding the long-term firm performance at the time of spinoff announcements.

It should be noted that subsidiary firms are not testable given the design of the tests. The informativeness measure for subsidiaries cannot be constructed since their stock prices do not exist prior to the spinoff. Alternatively, pre-spinoff combined-firm measures can be compared with a value-weighted combination of post-spinoff parent and subsidiary measures. However, this test is far from being accurate, as it implicitly assumes that informativeness is a linear function.

One can consider, for the purpose of the tests, a sample involving different corporate events such as carve-outs and tracking stocks. It should be noted, however, that a carve-out

generates cash inflows to the parent firm, a profit from the sale of its subsidiary IPO. The cash inflows can be used to finance new projects, thus changing investments and profitability of the parent temporarily. Therefore, it is crucial to disentangle the effect of the cash infusion on operating performance from the effect of changes in informativeness. Tracking stocks, on the other hand, affect the information environment of a firm without altering its organizational structure, providing a more attractive sample for the tests.[11] A drawback of using tracking stocks is the small sample size. Previous studies on tracking stocks report only dozens of observations in the U.S. markets since the introduction of tracking stock.[12]

4.2 Price informativeness and investment decisions

The evidence so far supports the view that changes in informativeness of the stock price are positively associated with changes in subsequent operating performance. Naturally, the next question is how price informativeness affects performance. In this section, I investigate whether managerial decisions serve as a channel through which informativeness contribute to performance. In particular, I examine whether increased informativeness of stock price facilitates more efficient investment decisions. To evaluate managerial investment decisions, I rely on Q theory, which suggests that firms should invest more (less) as their investment opportunities increase (decrease). In other words, investment efficiency is evaluated in terms of the alignment between a firm's investment opportunity and its level of actual investment. If the stock price provides information feedback on managerial investment decisions, those

[11] Tracking stocks are launched to track the performance of a division of interest in a multidivisional firm, and holders of these stocks have limited voting rights and no claim on assets.

[12] Billett and Mauer (1998) identify 20 tracking stock transactions from 1980 through the first quarter of 1997. Similarly, Zuta (1997) uses a sample of 20 tracking stock transactions.

firms with increased informative following the spinoff should align their investment with their investment opportunity better after the spinoff.

Matching firms' investments and investment opportunities are used as benchmarks to evaluate investment efficiency of sample firms. Sample firms are sorted into four subgroups based on their pre-spinoff investments and investment opportunities relative to those of their matching firms. Within each group, post-spinoff investments of information-increasing firms are compared with those of information-decreasing firms. Changes in informativeness are captured by changes in the firm-specific return variation (MM). Industry-adjusted investment is a sample firm's investment minus that of its matching firm. Tobin's average Q is used as a proxy for investment opportunities. Pre-spinoff Q and investments are averaged over the two years prior to the spinoff and post-spinoff values are averaged over the two years following the spinoff.[13] (See the Appendix for more detailed description of the variables.)

The full sample results (table 7) show that changes in industry-adjusted investment around the spinoff are overall insignificant. It appears that parent firms, on average, do not alter their investment behavior considerably. More intriguing is the results for the subgroups. Table 6 reports the pre-spinoff industry-adjusted investment, post-spinoff industry-adjusted investment, and changes in industry-adjusted investment around the spinoff for the following four subgroups: (1) $Q > 0$ and $I > 0$; (2) $Q < 0$ and $I < 0$; (3) $Q > 0$ and $I < 0$; and (4) $Q < 0$ and $I > 0$. $Q > 0$ indicates that a sample firm's investment opportunity is higher than that of its matching firm, and $I > 0$ indicates that a sample firm's investment is higher than that of its matching firm. Group (1) comprises 48 firms that have both investment *(I)* and investment

[13] Using capital expenditure averaged over two-year period appears to be preferable to using a one-year value, as it reduces influences of lumpy capital expenditures specific to some year. Thus, I report the results based on two-year averages here. However, I also perform the same tests using one-year values. I construct pre-spinoff Q and investment using year –1 values and post-spinoff Q and investment using year +1 values. The results are qualitatively the same as those using two-year-average measures and are not reported here.

opportunities (Q) higher than their matching firms prior to the spinoff. Q theory suggests that they should continue to invest more than their matching firms to avoid inefficient investment. However, both information-increasing firms and information-decreasing firms cut down on their investment. The magnitude of reduction is much stronger with information-decreasing firms. Median change in investment for the information-increasing firms is –0.0140 whereas median change for the information-decreasing firms is –0.0252. Group (2) includes 73 firms that have both Q and I lower than those of their matching firms prior to the spinoff. Subsequent to the spinoff, both information-increasing firms and information-decreasing firms maintain their investment level lower than that of their matching firms, meeting the criteria for investment efficiency. The firms in Groups (3) and (4) demonstrate inefficient asset allocation before the spinoff. Group (3) comprises 47 firms that underinvest prior to the spinoff. Those firms with increased informativeness following the spinoff respond to their problem by investing significantly more relative to their matching firms after the spinoff, as Q theory suggests. On the other hand, those firms with decreased informativeness increase their investment by only an insignificant amount. The median change in investment for information-increasing firms is 0.0150 and the median change for information-decreasing firms is 0.0017. Group (4) shows similar results for the 55 firms that overinvest prior to the spinoff. In this group, information-increasing firms cut down on their investment heavily, ameliorating their overinvestment problem. By contrast, information-decreasing firms do not change their investment behavior significantly after the spinoff. The median change in investment for information-increasing firms is –0.0093, which is significant at the 1% level, while the median change for information-decreasing firms is 0.0004, which is statistically insignificant. Information-increasing firms exhibit more improvement not only in the

statistical sense but also in terms of the economic magnitude. Overall, those firms with increased informativeness following the spinoff appear to make better adjustments to resolve inefficient investment problem after the spinoff, suggesting that investment decisions are one of the channels through which informative stock price can induce managers to improve operating performance.

As a caveat, it should be noted that even if we could not find any evidence relating informativeness to investment decisions, we should not dismiss the role of information in the real sector. Informativeness may affect operating performance through different routes that are not captured by the investment measures. Furthermore, my tests address only the quantitative aspect of investment decisions. The qualitative aspect of the decisions is not considered in this study.

4.3 Robustness checks

In this section, I implement a number of robustness checks to address potential problems that can be caused by the characteristics of the data. On a general level, I adopt the Heckman's two-stage estimation procedure (Heckman (1979)) for the test of sample selection bias. On a microscopic level, I examine three specific alternative hypotheses that may explain the performance changes around the spinoff.

4.3.1 Test of sample selection bias

One might argue that using a sample of spinoffs can cause self-selection bias as corporate spinoffs are not a random sub-sample of the population of firms. Some unobserved factor that drives firms to opt for spinoffs might be also correlated with both informativeness of

trading and operating performance. Therefore, I investigate whether the association between informed trading and operating performance is robust to the tests of sample selection bias. Heckman's two-stage estimation procedure is designed to control for the characteristics that cause selection bias (Heckman (1979)). The hypothesis is that the set of firms that choose to spin off does not represent a random sample of firms. The first-stage PROBIT estimation identifies firm characteristics correlated with the spinoff decision. For the PROBIT estimation, I pool the sample firms and their matching firms and estimate the following equation.

$$D_i^* = \gamma_0 + \gamma_1 \cdot F_i + \mu_i$$
$$D_i = 1 \quad \text{if } D_i^* > 0$$
$$D_i = 0 \quad \text{if } D_i^* < 0,$$

where F_i is a set of firm characteristics that may affect the decision to spin off. $D_i = 1$ if a firm chooses to spin off and 0 otherwise. D_i^* is an unobservable variable. If $D_i^* > 0$, a firm decides to spin off. The variables employed in the first-stage estimation are Tobin's average *Q*, investment level, year –1 ROA, year –2 ROA, year –3 ROA, standard deviation of three ROAs, the number of segments in a firm, pre-spinoff level of systematic and unsystematic stock return variation, leverage, and size. Tobin's *Q* is defined as market value of total assets divided by book value of total assets, where market value of total assets is book value of total assets plus market value of common equity minus book value of common equity minus deferred taxes. Investment level is capital expenditure divided by sales.[14] The likelihood of a

[14] Capital expenditure divided by total assets is also used as a measure of investment. Test results are similar to those using capital expenditure divided by sales and are not reported here.

spinoff is captured by a variable called Lambda, which is, in turn, introduced as the correction term for self-selection in the second-stage OLS estimation as follows:

$$\Delta ROA_i(+1, t) = \beta_0 + \beta_1 \cdot \Delta Info_i(-1, +1) + \beta_2 \cdot X_i + \beta_3 \cdot \hat{\lambda}_i + \eta_i,$$

where $\hat{\lambda}_i$ is the estimated value of λ_i and

$$\lambda_i = \frac{\phi(Z_i)}{\Phi(-Z_i)},$$

where ϕ and Φ are the density and distribution function for a standard normal variable, respectively, and

$$Z_i = -\frac{\gamma_0 + \gamma_1 \cdot F_i}{\sigma_\mu}.$$

If any of the firm characteristics variables described above is attributable to the spinoff decision and is correlated with informativeness and operating performance then β_3 must be significant. Furthermore, if the established relationship between informed trading and firm performance were, in fact, driven by the firm characteristics, the inclusion of $\hat{\lambda}_i$ would reduce the statistical significance of β_1.

In table 8, I report the two-stage estimation results. Several firm-characteristics variables are predictive of the spinoff decision. ROAs in year -3 and year -2 are significantly lower for

sample firms, indicating that firms that perform worse are more likely to spin off. This is consistent with the prediction of Chang and Yu (2004) that firms with lower ROAs and higher standard deviations of ROAs are more likely to spin off. Chang and Yu suggest that as a firm matures and more competitors enter into its business, driving down the profit and increasing risks, it tends to become focused, since additional information is more valuable when the firm faces low profit and high volatility. Firm-specific variation is significantly lower for the sample firms, implying that their stock prices prior to the spinoff are not as informative as those of matching firms. Less informative stock prices may provide an incentive for a firm to spin off in order to achieve more informed trading. The number of segments is significantly higher for sample firms. This can be interpreted in two ways. First, the level of informativeness may be captured by the number of segments. It is harder to interpret the signals contained in the stock price of multi-segment firms than those of single-segment firms, since the signals for all segments of a firm are pooled into a single stock price. Accordingly, reducing the number of segments via a spinoff would help managers understand the signals sent by informed traders. Another explanation is based on the assumption that there exists an optimal number of segments for a firm in an industry. If a firm has more segments than the optimal level, it may undertake a spinoff to become leaner. Both explanations predict a positive relation between the number-of-segments variable and the likelihood of a spinoff, consistent with the results. Tobin's *Q* is higher for sample firms, although not significant. This is consistent with the findings documented in the diversification literature. Lang and Stulz (1994), Hyland (1997), and Villalonga (2004) find that firms that diversify tend to be in low *Q* industries. Having little growth prospect in their own businesses, the firms are looking to take over other firms with greater investment

opportunities. Conversely, firms with high Tobin's *Q* may be looking to spin off so that they can improve focus on the business with greater investment opportunities.

Panel B of Table 8 tabulates the results of the second-stage OLS regressions. Regressions 1 and 3 use the firm-specific return variation (MM) as the informativeness measure and regressions 2 and 4 utilize the REBA as the informativeness measure.[15] Lambda, representing the likelihood of a spinoff, has different signs in the two regressions where Lambda is significant. It appears that the firm characteristics, while differentiating sample firms from their matching firms, have only a minimal effect on the association between performance and informativeness. The effect of informativeness becomes, in fact, stronger in three of the four regressions once firm characteristics correlated with the spinoff decision are taken into account. In particular, the coefficient of changes in firm-specific return variation is higher by 25% (15%) in the second (third) year after the spinoff than in the previous OLS regressions and is significant at the 1% level. Interestingly, excess return around spinoff announcements becomes highly significant, indicating that announcement-period market reactions are predictive of the subsequent operating performance. The fact that both changes in informativeness and excess return are significant implies that the two are complementary measures, capturing different aspects of informed trading. The rest of the control variables display similar patterns to those in the previous regressions. In sum, once the self-selection correction term is introduced, the association between price informativeness and operating performance is even stronger, providing additional support for the findings from the previous section.

[15] The firm-specific return variation (MI) is excluded from the analysis from this point on as it is highly correlated with the firm-specific return variation (MM), resulting in similar results.

4.3.2 Corporate focus hypothesis

I examine corporate focus hypothesis that focus-improving firms achieve better operating performance after spinoffs by getting rid of unrelated divisions and concentrating on the division for which managerial skills and resources are well-suited. A focus-improving spinoff refers to a cross-industry spinoff in which a parent firm improves its focus by spinning off an unrelated division. For empirical purposes, I categorize a spinoff as focus-improving if the parent and subsidiary have different two-digit SIC codes.[16] Previous studies document that elimination of negative synergy between the divisions via divestitures such as asset sales and spinoffs is associated with an improvement in operating performance. John and Ofek (1995) find that asset sales lead to an improvement of operating performance relative to the year of asset sales for focus-improving sellers. Daley, Mehrotra, and Sivakumar (1997) and Desai and Jain (1999) report a significant improvement in post-spinoff industry-adjusted operating performance for the focus-improving parents.

I first compare the changes in operating performance of focus-improving and non-focus-improving spinoffs. Consistent with the previous studies, the results show (table 9, panel A) that focus-improving parents demonstrate a significant improvement in industry-adjusted operating performance relative to the first year after the spinoffs. The mean changes in performance from year +1 to +2 and year +1 to +3 are 0.0286 and 0.0318 and are significant at the 5% and 10% level, respectively. Non-focus-improving parents, on the contrary, do not exhibit significant changes in performance. The mean and median changes from year +1 to year +2 are barely above zero and mean and median changes from year +1 to +3 turn negative. Interestingly, the mean and median performance changes of focusing parents are

[16] If a firm spins off more than one subsidiary, and one subsidiary has the same two-digit SIC code as the parent and the others do not, the firm is excluded from the categorization.

not significantly different from those of non-focusing parents, implying that the focus improvement may not explain the changes in operating performance. The comparison between information-increasing firms and information-decreasing firms appears to explain the change in operating performance better (table 9, panel B). For instance, the mean (median) difference in operating performance from year +1 to year +2 between information-increasing firms and information-decreasing firms is 0.0535 (0.0173), more than twice the difference between focus-improving firms and non-focus-improving firms.[17]

The relative importance between the focus improvement and changes in informativeness is reassured in the regression results (table 9, panel C). The univariate analysis (regressions 1 and 4) does not find any significant association between focus and performance changes, where focus is an indicator variable that equals 1 for focus-improving spinoffs and 0 for non-focus-improving spinoffs. In regressions 2 and 5, I regress changes in operating performance on focus, changes in firm-specific return variation (MM), and a set of control variables. Whereas the focus variable is not significant, the changes in informativeness are positively and significantly related to performance change in the presence of corporate focus variable. Regressions 3 and 6 use changes in the REBA as an informativeness measure instead and find qualitatively same results as regressions 2 and 5. In conclusion, while focus-improving firms demonstrate some improvement in operating performance that non-focus-improving firms do not, the effect of the focus improvement is not statistically strong enough to explain the changes in operating performance, and the effect of informativeness on operating performance continues to prevail with the inclusion of corporate focus.

[17] The firm-specific return variation (MM) is utilized as an information measure. Using the REBA as an informativeness measure produces qualitatively same results.

4.3.3 Subsidiary performance hypothesis

I test whether the removal of poorly performing subsidiaries explains the subsequent performance improvement of the parents following the spinoff. I call this the subsidiary performance hypothesis. Evidently, some of the spinoffs are undertaken to eliminate poorly performing subsidiaries. For instance, American Express Co. unloaded several underperforming businesses by spinning off its subsidiary, Ameriprise Financial, Inc., in September, 2005, after which its share was expected to sell higher by 25% or more (BusinessWeek, 2005).

Subsidiary financial data are obtained from COMPUSTAT. Pre-spinoff pro forma financial data are available for 157 subsidiaries. I focus on median values because mean values are driven by one extreme observation. Contrary to the prediction of the hypothesis, I find that the spun-off subsidiaries of the sample firms do not, on average, underperform their matching firms before or after the spinoff at the significant level (table 10, panel A). Median industry-adjusted performance of the subsidiaries is 0.0253, 0.0133, –0.0068, and –0.0061 in years –1, +1, +2, and +3, respectively. Although the performance turns negative in the second and the third years after the spinoff, none of the values is significantly different from zero. Moreover, the performance changes of the parents over the three-year post-spinoff testing period are not significantly correlated with the pre-spinoff performance of the subsidiaries nor with the performance changes of the subsidiaries over the testing period (table 10, panel B). These results indicate that the performance of the subsidiaries does not explain the subsequent performance changes of the parents. The regression analysis also suggests that the subsidiaries' performance does not affect the association between informativeness and operating performance (not reported).

4.3.4. Internal capital market hypothesis

The internal capital market hypothesis proposes that capital allocation efficiency is improved by dismantling internal capital markets via spinoffs. After the spinoff, the parent is unable to ration or subsidize its spun-off subsidiary, which may improve or worsen its capital allocation efficiency. Previous studies provide evidence that spinoffs alter capital allocation. Gertner, Powers, and Scharfstein (2002) find that subsidiaries' investment becomes more sensitive to their investment opportunities after the spinoff. Ahn and Denis (2004) examine the parents and subsidiaries at the segment level and conclude that investment efficiency of the segments is improved after the spinoff. Dittmar and Shivdasani (2003) report that asset sales lead to an improvement in investment efficiency for the remaining divisions.

The test results indicate that the firms that underinvested (overinvested) prior to the spinoff tend to increase (reduce) investment, consistent with the internal capital market hypothesis.[18] However, this improvement in investment efficiency is primarily found among the information-increasing firms even though spinoffs dismantle the internal capital markets of all sample firms (table 7). In other words, while the effect of dismantling internal capital market exists, increased stock price informativeness around the spinoff helps managers improve their capital allocation decisions even more.

[18] In table 6, I report a comparison of the investment efficiency of information-increasing firms and that of information-decreasing firms. The investment efficiency of the combination of these two groups of firms is not reported in the table.

CHAPTER V

EMPIRICAL RESULTS - PART II

The investigation so far has focused on the impact of stock price informativeness in the real sector. In the second part of the study, I extend the boundary of my investigation to include the structural change in CEO compensation around the spinoff. Table 4 reports that firms increase stock-based compensation significantly following spinoffs (the results are discussed in section 3). Therefore, it is only natural to analyze whether this increase in stock-based compensation affects subsequent firm performance.

Using the same sample of corporate spinoffs featured in the first part, I investigate whether stock-based compensation is an effective tool to structure managers' incentive by examining the association between changes in stock-based compensation and changes in subsequent performance. I also examine whether stock-based compensation helps induce managers to study the stock price as a way to improve the performance. One way to analyze this view is to test a hypothesis that changes in informativeness around the spinoff and subsequent changes in performance have a stronger association when a greater proportion of CEO compensation is tied to stock performance.

5.1 CEO compensation structure and operating performance

In this subsection, I test a hypothesis that changes in stock-based compensation are positively related to the changes in subsequent performance. First of all, I conduct a simple

univariate analysis. Firms are divided into two sub-groups depending on whether performance-sensitive compensation around the spinoff increases or not. The hypothesis implies that those firms providing greater proportion of performance-related compensation to CEOs following spinoffs are likely to have more improvement in subsequent operating performance. Panel A of table 11 indicates that change in stock-based compensation (SBC) is positively related to subsequent change in performance. Those firms with increased SBC following spinoffs demonstrate an increase of 0.74% (0.24%) in industry-adjusted operating performance in year +3 (year +2) relative to year +1 whereas those with decreased SBC demonstrate a reduction of -0.80% (-0.01%). The positive relationship between SBC and performance is consistent with the hypothesis. However, the results using delta show that those firms with increased delta perform worse (better) in year +2 (year +3) relative to year +1. Two possible explanations arise. First, individual delta does not capture pay-performance relationship effectively due to the lack of observation. Second, overall CEO pay-performance sensitivity may not be as effective as SBC in terms of providing incentives for performance improvement.

Next, I conduct a multivariate analysis by estimating the following equation.

$$\Delta ROA_i(+1,t) = \beta_0 + \beta_1 \cdot \Delta Comp_i(-1,+1) + \beta_2 \cdot \Delta Info_i(-1,+1) + \beta_3 \cdot X_i + \varepsilon_i,$$

where $\Delta ROA_i(+1,\ t)$ is the proxy for change in operating performance of parent firms around the spinoff and is obtained by measuring industry-adjusted changes in return on assets from the first fiscal year after the spinoff to the second year ($t = 2$) or the third year ($t = 3$). $\Delta Comp_i(-1,+1)$ is the change in a compensation structure from the pre-spinoff to the post-

spinoff period. Each of the two measures of compensation structure described in the previous section is applied, respectively. $\Delta Info_i(-1,+1)$ is the change in informativeness of stock prices of parent firms from the pre-spinoff to the post-spinoff period. Informativeness is measured by firm-specific return variation (MM) introduced in the first essay. For all regressions, the main variables, compensation structure, informativeness, and operating performance, are trimmed at the 1 % level to prevent outliers from influencing the results. X_i is the set of control variables: pre-spinoff level of informativeness, changes in beta, changes in leverage, size, and 3-day excess return around spinoff announcements. These variables are reasonable choices to explain the change in operating performance (for more details on the control variables, please refer to the appendix).

For the hypothesis to hold, β_1 must be greater than zero. This regression also provides a horse race between compensation and informativeness measures. If β_1 is positive and significant and β_2 is not, the relationship between informativeness and performance suggested in the first essay may be interpreted as a mere spurious relationship in that the change in compensation can explain the performance change explained by price informativeness.

Panel B of table 11 reports multivariate regressions results using performance changes from year +1 to year +2 and those from year +1 to year +3 as a dependent variable, respectively. Change in SBC around the spinoff is positively and significantly related to subsequent change in operating performance for both dependent variables, suggesting that additional stock-based compensation following the spinoff provides an incentive for a CEO to exert more effort to improve operating performance. As was the case in univariate analysis, delta does not have any significant impact on subsequent performance. In addition to the

possible reasons listed following univariate analysis, these weak results using delta may also, in part, have to do with the insignificant change in delta around the spinoff. The coefficient for change in informativeness measure stays positive and significant throughout all four regressions, indicating that the effect of price informativeness on firm performance is not replaced by compensation structure.

5.2 Interaction between CEO compensation structure and price informativeness

In this subsection, I estimate the following equation to test the hypothesis that changes in informativeness around the spinoff and subsequent changes in performance have a stronger association when a greater proportion of CEO compensation is tied to stock performance.

$$\Delta ROA_i(+1,t) = \beta_0 + \beta_1 \cdot \Delta Comp_i(-1,+1) + \beta_2 \cdot \Delta Comp_i(-1,+1) \cdot \Delta Info_i(-1,+1) + \beta_3 \cdot \Delta Info_i(-1,+1) + \beta_4 \cdot X_i + \varepsilon_i$$

To evaluate the potential interaction between informativeness and compensation structure suggested in hypothesis, $\Delta Comp_i(-1,+1) \cdot \Delta Info_i(-1,+1)$, a product term between the two variables is introduced. In addition, pre-spinoff level of compensation structure measure is included as a control variable.

Table 12 reports regressions results using $\Delta ROA(+1,+2)$ and $\Delta ROA(+1,+3)$ as a dependent variable, respectively. The coefficient for change in stock-based compensation stays positive for both regressions (regressions 1 and 3) although it is insignificant in regression 1. The product of informativeness and SBC, the term of interest in the hypothesis, is not significant. Moreover, its sign flips from one regression to the other. When delta is

utilized as the compensation structure measure, both changes in delta and the interaction term are insignificant. Informativeness measure is positive and significant throughout all regressions. Control variables are largely insignificant with the exception of pre-spinoff level of informativeness.

The evidence so far provides two implications. First, while performance-based compensation seems to be an effective tool to induce managers to improve performance, it is not related to the association between price informativeness and firm performance. Second, the results show that the association between informativeness and performance stays positive and significant, controlling for the change in compensation structure around the spinoff. These results provide additional support for the findings from the first part.

5.3 Robustness checks

In this subsection, I check for the robustness of the results by exploring performance-sensitive measures alternative to CEO compensation. I introduce two measures of performance-related CEO wealth. First measure is named stockholding and is defined as a ratio of dollar values of shares owned by a CEO to the value of the CEO's total compensation. This measure estimates the value of CEO's wealth tied to the firm stock performance. Stockholding complements the previously described compensation structure measures in that stockholding, being performance-sensitive wealth, gives a CEO an incentive to exert all his effort even when the firm does not provide him with performance-sensitive compensation. Pre-spinoff (post-spinoff) stockholding is the average of year -4 through year 0 (year +1 through year +3). Change in stockholding is post-spinoff stockholding minus pre-spinoff stockholding.

The second measure is ownership and is defined as the ratio of the number of shares owned by a CEO to the number of shares outstanding. A significant ownership of the firm may provide CEOs with an incentive to improve the firm performance as higher CEO ownership reduces possible agency conflict presented in Jensen and Meckling (1976). CEO ownership of the firm implies that the CEO's utility is in accordance with the shareholders' utilities. Thus, a CEO holding a sizable portion of the firm equity will exert more efforts to maximize the firm value even when incentive compensation scheme is not present.

Panel A of table 13 reports that the changes in stockholding and ownership around the spinoff are negative. This may seem counter-intuitive especially because the results on SBC suggest that the firms increase stock-based compensation following spinoffs. However, one should note that the stock and option grants are not reflected in CEO ownership immediately due to the restriction on exercise: restricted stocks typically vest over 5-year period and options are generally granted with a 10-year duration and vest over a 3-5 year period. Furthermore, these grants are forfeited if the CEO leaves the firm before the restrictions lapse. In fact, the reduction in stockholding and ownership is a mere artifact caused by the high rate of CEO turnover around the spinoff. 55% (66%) of the firms in post-1991 data replace their CEO between year 0 and +1 (year -1 and +1) (the tables are not reported here). CEO ownership is highly and positively correlated with his tenure. Therefore, a new CEO appointed following a spinoff tends to have much lower ownership of the stocks.[19] It seems

[19] One may argue that the significant rise in SBC following the spinoff may be an artifact caused by CEO turnover around the spinoff. Firms tend to provide more stock-based compensation in an early stage of a CEO's tenure and less in later stage. As a reason for this behavior, Bryan, Hwang, and Lilien (2000) argue that "when CEOs hold a large fraction of their firms' equity, the demand for further stock-based compensation is likely to be reduced, since the interests of CEOs and shareholders are relatively aligned already." Empirically, this negative correlation is supported by Mehran (1995) and Bryan, Hwang, and Lilien (2000). However, a simple test shows that the change in SBC for the firms without CEO turnover around the spinoff is not significantly different from the change in SBC for those with CEO turnover.

that this artificial reduction in stockholding and ownership makes the test results based on these two measures unreliable.

Panel B of table 13 reports multivariate regressions results using $\Delta ROA(+1,+2)$ and $\Delta ROA(+1,+3)$ as a dependent variable. Neither of the two measures has a significant impact on subsequent performance. It is possible that the artificial change in CEO stockholding/ownership associated with CEO turnover around the spinoff may dilute the true impact of increased stockholding or ownership on firm performance. The coefficient for change in informativeness measure stays positive and significant throughout all eight regressions, implying that the effect of price informativeness on firm performance is not replaced by the wealth-related measures.

CHAPTER VI

CONCLUSION

This paper empirically investigates the role of stock price informativeness in the real sector using a sample of corporate spinoffs from 1975 to 2001. The paper consists of two parts. In the first part, I examine the impact of stock price informativeness on a firm's managerial decisions and operating performance. I find a strong, positive association between changes in informativeness of stock prices around the spinoff and changes in operating performance of parent firms from the first year after the spinoff to the second or the third year. Furthermore, those firms with increased informativeness make better adjustments to achieve investment efficiency following the spinoff, suggesting that managerial investment decisions serve as one of the channels through which informative stock price contribute to operating performance. The findings are robust to a number of sensitivity checks. On a general level, I adopt Heckman's two-stage estimation procedure for the test of sample selection bias. The introduction of a self-selection correction term does not affect the findings. On more microscopic level, I examine three alternative explanations regarding performance changes proposed in the spinoff literature. I confirm the effect of stock price informativeness, taking into consideration the effect of changes in corporate focus, of the dismantling of internal capital markets, and of the removal of poorly performing subsidiaries.

In the second part of the study, I study the structural changes in CEO compensation around the spinoff and examine how compensation structure relates to the association between stock

price informativeness and operating performance established in the first part. I find that firms increase the proportion of stock-based compensation significantly following the spinoff. This change in stock-based compensation is positively related to the subsequent change in operating performance, suggesting that stock-based compensation is an effective tool in structuring managerial incentives. I also test whether stock-based compensation helps induce managers to study the stock price as a way to improve performance. The results suggest there is no significant interaction between informativeness and compensation structure. Throughout all regressions, the association between informativeness and performance stays positive and significant, providing additional support for the findings from the first part. My findings provide one of the first pieces of evidence supporting the view that information production in capital markets not only plays a role in financial sector but also contributes to the real sector.

Table 1:

Summary Statistics: Spinoff Data

Panel A reports the distribution of 268 spinoffs by year. Panel B reports three summary statistics for parent companies. Market value of parent is measured at the end of the month of spinoff distribution. Total assets are the value at the end of first fiscal year after spinoff distribution. Relative size of parent is calculated as the total assets of the parent in year +1 divided by sum of total assets of parent and that of subsidiary in year +1. Missing values were generated for subsidiaries whose COMPUSTAT data was unavailable.

Panel A: Distribution of Spinoff by Year

Year	Number	Year	Number
1975	3	1989	9
1976	2	1990	8
1977	1	1991	8
1978	1	1992	10
1979	3	1993	15
1980	7	1994	12
1981	9	1995	13
1982	8	1996	14
1983	8	1997	22
1984	12	1998	10
1985	10	1999	18
1986	6	2000	22
1987	8	2001	17
1988	12	Total	268

Panel B: Summary Statistics for Parent Firms

	N	Mean	Median
Market value (Million 1995 $)	268	4222.07	580.31
Total assets (Million 1995 $)	268	5177.72	840.70
Relative size of parents	226	0.7067	0.7634

Table 2:

Changes in Informativeness and Operating Performance around Spinoffs

Panel A reports changes in the firm-specific return variation (MM), changes in the firm-specific return variation (MI), and changes in the relative effective bid-ask spread (REBA) around spinoffs. Firm-specific return variation (MM) is the standard deviation of market model residuals. Firm-specific return variation (MI) is calculated by regressing firm return on market return and industry return and calculating the standard deviation of the regression residuals. Industry return is value-weighted return of all firms (excluding a sample firm) that have same 3-digit SIC code as the sample firm. REBA is calculated as two times the absolute difference between the transaction price and the midpoint of the quoted bid and ask outstanding at the time of the trade, divided by the quote midpoint. Quotes were lagged 5 seconds to mitigate nonsynchronous recording of trades and quotes. The pre-spinoff period for the informativeness measures is the 250 trading days ending 50 days prior to the first public announcement of spinoffs, and the post-spinoff period is the 250 days beginning 50 days after the dates of spinoff distribution. Panel B reports correlation among the three information measures. Panel C reports raw ROA and industry-adjusted ROA of parent firms from year +1 to year +3, where year 0 is defined as the year of spinoff distribution. Industry-adjusted ROA is obtained by subtracting matching firm ROA from parent firm ROA, where the matching firm is the firm that has the same four-digit SIC code as the sample firm and is closest to it in market value of equity in the month of spinoff. Sample sizes vary because some firms do not have matching firms.

Panel A: Changes in Informativeness around Spinoffs

	N	Mean	Median	St.dev.
Firm-specific return variation (MM)				
Pre-spinoff	268	0.0244	0.0218	0.0128
Post-spinoff	267	0.0280	0.0242	0.0157
Changes	267	0.0036***	0.0026***	0.0127
Firm-specific return variation (MI)				
Pre-spinoff	266	0.0241	0.0213	0.0128
Post-spinoff	265	0.0277	0.0236	0.0158
Changes	264	0.0036***	0.0026***	0.0127
REBA				
Pre-spinoff	205	0.0133	0.0074	0.0263
Post-spinoff	214	0.0179	0.0106	0.0206
Changes	205	0.0042**	0.0010***	0.0261

Panel B: Correlation among Information Measures

	Firm-specific return variation (MI)	REBA
Firm-specific return variation (MM)	0.9971***	0.2492***
Firm-specific return variation (MI)		0.2601***

Panel C: Operating Performance of Parent Firms from Year +1 to Year +3

	ROA			Industry-adjusted ROA		
	N	Mean	Median	*N*	Mean	Median
Year +1	268	0.1297	0.1321	246	0.0378***	0.0150***
Year +2	267	0.1326	0.1362	239	0.0551***	0.0211***
Year +3	252	0.1238	0.1243	204	0.0592***	0.0187***

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level.

Table 3:

Summary Statistics: CEO compensation

This table reports median CEO compensation by year. Total compensation (unit: thou $) is the sum of salary, bonus, restricted stock grant, option grant, long-term incentive payouts, and all other payments. Stock-based compensation (unit: thou $) is the sum of restricted stock grant and option grant. Stock-based comp. (%) is defined as the ratio of the sum of restricted stock grants and option grants to total compensation.

year	Number of obs.	Total Comp. (thou $)	Stock-based comp. (thou $)	Stock-based comp. (%)	Proportion of firms with stock comp. (%)
1977	5	188.15	0	0	40.0
1978	13	216.3	0	0	15.4
1979	17	242.5	0	0	41.2
1980	29	228.434	0	0	37.9
1981	39	324.805	0	0	15.4
1982	50	265.062	0	0	32.0
1983	51	350.004	0	0	30.2
1984	41	396.622	0	0	26.8
1985	43	462.172	0	0	39.5
1986	38	570.624	0	0	47.4
1987	58	673.913	50.264	10.7	55.2
1988	55	714.94	0	0	45.5
1989	47	695.087	0	0	42.6
1990	39	757.973	96.845	17.1	61.5
1991	34	906.717	210.198	22.3	67.7
1992	44	1343.56	235.589	20.7	70.5
1993	60	2081.55	385.208	25.1	80.0
1994	62	2126.69	515.842	28	71.0
1995	65	2734.98	651.899	26.2	76.9
1996	70	3939.81	1890.6	49.6	87.1
1997	83	3300.33	1001.23	40.9	78.3
1998	74	4125	1873.66	47.3	86.5
1999	72	4268.65	2096.57	50.1	87.5
2000	61	5076.68	2819.9	58	78.7
2001	51	4581.72	1853.23	49.6	82.4
2002	44	3984.12	2043.42	50.5	84.1
2003	34	3839.84	2320.35	55.6	85.3
2004	13	4888.44	2016.32	40.8	92.3
All years	1292	1418.46	264.497	22.6	63.7

Table 4:

Summary Statistics: Measures of Compensation Structure

SBC is the stock-based compensation. Pre-spinoff (post-spinoff) SBC is the average of year -4 through year 0 (year +1 through year +3). Change in SBC is post-spinoff SBC minus pre-spinoff SBC. Pre-spinoff and post-spinoff stockholding and ownership are calculated in the same way. Delta measures how responsive CEO compensation is to the firm's stock performance and is obtained by estimating the coefficient in the following regression: Δ (CEO total compensation)$_t$ = a + b·Δ (shareholder wealth)$_t$.

	N	Mean	Min	Q1	Median	Q3	Max
SBC							
pre-spinoff	198	0.25776	0	0.03437	0.23518	0.40468	0.88141
post spinoff	212	0.29689	0	0.03896	0.27950	0.49642	0.97163
changes	196	0.04292***	-0.47932	-0.06801	0.01211***	0.15693	0.75574
Delta							
pre-spinoff	155	0.00166	-0.02285	-0.00059	0.00001	0.00091	0.09311
post spinoff	174	-0.00443	-0.56250	-0.00108	0.00019	0.00191	0.18851
changes	135	-0.00916*	-0.61647	-0.00325	-0.00001	0.00227	0.05846

* Significant at the 0.10 level; *** Significant at the 0.01 level.

Table 5:

Regressions Results: Univariate Analysis

This table reports Ordinary Least Squares regression estimation results using three informativeness measures. First measure is the change in the standard deviation of market model residuals from pre-spinoff to post-spinoff. Second measure is the change in the firm-specific return variation and is constructed by regressing firm return on market return and industry return and calculating the standard deviation of the regression residuals. Industry return is the value-weighted returns of all firms (excluding the sample firm) that have the same 3-digit SIC code as the sample firm. The last information measure is the change in the relative effective bid-ask spread (REBA) from pre-spinoff to post-spinoff. The pre-spinoff period is defined as the 250 trading days ending 50 days prior to the first public announcement of a spinoff and the post-spinoff period is defined as the 250 days beginning 50 days after the date of spinoff distribution. The dependent variables are changes in industry-adjusted ROA of parent firms from year +1 to +2 and from year +1 to year +3, where year 0 is defined as the year of spinoff distribution. Sample sizes vary because of missing COMPUSTAT data or missing Trades and Quotes data. t-statistics are in parentheses. White's heteroskedasticity-consistent standard errors are utilized for all regressions.

	Δ ROA (+1,+2)			Δ ROA (+1,+3)		
	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6
Intercept	0.0077	0.0077	0.0074	0.0043	0.0039	–0.0060
	(1.18)	(1.19)	(0.81)	(0.38)	(0.35)	(–0.44)
Δ Firm-specific return variation (MM)	2.3962*			3.8713**		
	(1.69)			(1.95)		
Δ Firm-specific return variation (MI)		2.5554*			3.9847*	
		(1.73)			(1.90)	
Δ REBA			2.0030**			1.7795**
			(2.03)			(2.29)
N	232	230	178	196	194	153
Adj. R2	0.0306	0.0336	0.0408	0.0453	0.0465	0.0283

* Significant at the 0.10 level; ** Significant at the 0.05 level.

Table 6:

Regression Results: Multivariate Analysis

This table reports multivariate analysis results. The dependent variables are changes in industry-adjusted ROA of parent firms from year +1 to +2 and from year +1 to year +3, where year 0 is defined as the year of spinoff distribution. Control variables include systematic return variation (for first two information measures only), change in leverage from year − 1 to year +1, change in beta (a coefficient of market return variable in market model regression), size (log of total assets in the first fiscal year after spinoff distributions), and 3-day excess return around spinoff announcements. Leverage is calculated by dividing total debt by total assets, where total debt is the sum of long-term debt and debt in current liabilities. Excess return is calculated using market model and value-weighted market returns. Sample sizes vary because of missing COMPUSTAT data or missing Trades and Quotes data. *t*-statistics are in parentheses. White's heteroskedasticity-consistent standard errors are utilized for all regressions.

	Δ ROA (+1,+2)			Δ ROA (+1,+3)		
	Reg. 1 (MM)	Reg. 2 (MI)	Reg. 3 (REBA)	Reg. 4 (MM)	Reg. 5 (MI)	Reg. 6 (REBA)
Intercept	–0.0794	–0.0834	0.0622	–0.0214	–0.0160	0.0728
	(–1.20)	(–1.17)	(0.95)	(–0.30)	(–0.21)	(0.78)
Δ Informativeness of stock price	3.8634**	4.1078**	2.2127**	4.5795**	4.7583**	1.7455**
	(2.11)	(2.16)	(2.18)	(2.22)	(2.24)	(2.23)
Pre-spinoff Informativeness	2.5421	2.5487	–0.3525	1.6042	1.4095	–3.0214
	(1.43)	(1.38)	(–0.51)	(1.09)	(0.91)	(–1.17)
Δ Systematic variation	–1.9223	–2.0189*		–1.5878	–1.3796	
	(–1.45)	(–1.67)		(–0.84)	(–0.90)	
Pre-spinoff systematic variation	–0.6779	–0.3661		0.2685	0.6542	
	(–0.42)	(–0.45)		(0.10)	(0.53)	
Δ Beta	0.0194	0.0194	0.0469**	0.0295	0.0304	0.0558**
	(1.17)	(1.19)	(2.31)	(1.47)	(1.56)	(2.4)
Δ Leverage	0.0346	0.0326	–0.1225**	0.0750	0.0746	–0.1087
	(0.48)	(0.45)	(–2.11)	(0.84)	(0.85)	(–1.47)
Size	0.0042	0.0048	–0.0065	–0.0034	–0.0038	–0.0085
	(0.84)	(0.86)	(–0.78)	(–0.46)	(–0.48)	(–0.81)
Excess return	–0.0375	–0.0389	–0.0324	0.1334	0.1246	0.3868*
	(–0.19)	(–0.19)	(–0.13)	(0.73)	(0.67)	(1.70)
N	208	207	159	175	174	136
Adj. R2	0.1141	0.1202	0.1383	0.1216	0.1224	0.1782

Table 7:

Industry-adjusted Investments around Spinoffs

This table reports mean and median pre-spinoff and post-spinoff industry-adjusted investments as well as change in investments around the spinoff. Investment level is reported for the full sample and four subgroups, which are formed based on the firms' pre-spinoff levels of industry-adjusted investment opportunities (Q) and industry-adjusted investment (I). Within each subgroup, industry-adjusted investments of information-increasing firms and information-decreasing firms are compared. Industry-adjusted investment is defined as the sample firm's investment minus its matching firm's investment. Investment is capital expenditure divided by sales. Q is Tobin's average Q, which is defined as market value of total assets divided by book value of total assets, where market value of total assets is book value of total assets plus market value of common equity minus book value of common equity minus deferred taxes. $\Delta Info$ is changes in the informativeness around the spinoff, and the information measure utilized here is the firm-specific return variation (MM). Pre-spinoff values are averaged over year –1 and year –2. Post-spinoff values are averaged over year +1 and year +2.

	Full sample	(1) $Q > 0, I > 0$		(2) $Q < 0, I < 0$		(3) $Q > 0, I < 0$		(4) $Q < 0, I > 0$	
		$\Delta Info > 0$	$\Delta Info < 0$	$\Delta Info > 0$	$\Delta Info < 0$	$\Delta Info > 0$	$\Delta Info < 0$	$\Delta Info > 0$	$\Delta Info < 0$
Mean	–0.0220*	0.0647***	0.0820**	–0.1173***	–0.0940**	–0.1000***	–0.0800***	0.0572***	0.0900***
Median	–0.0019*	0.0262***	0.0348***	–0.0405***	–0.0472***	–0.0616***	–0.0496***	0.0258***	0.0425***
Mean	–0.0292	0.0489	0.0651**	–0.0691***	–0.2517	–0.0434***	–0.0648*	0.0262**	0.0875
Median	–0.0088**	0.0163	0.0127*	–0.0327***	–0.0143**	–0.0344***	–0.0269**	0.0188**	0.0347*
Mean	–0.0073	–0.0159	–0.0169	0.0483*	–0.1577	0.0566**	0.0153	–0.0311**	–0.0025
Median	–0.0014	–0.0140*	–0.0252**	0.0071*	0.0117*	0.0150*	0.0017	–0.0093***	0.0004
N	223	30	18	47	26	30	17	29	26

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level.

Table 8:

Heckman's Two-stage Estimation

This table reports results of Heckman's two-stage estimation. Sample firms and matching firms are pooled to for the first-stage estimation. Tobin's *Q* is defined as market value of total assets divided by book value of total assets, where market value of total assets is book value of total assets plus market value of common equity minus book value of common equity minus deferred taxes. Investment level is calculated by dividing capital expenditure by sales. Sample sizes vary because of missing COMPUSTAT data. *t*-statistics are in parentheses.

Panel A: First-stage PROBIT Estimation

	Coefficient	*z*-statistic	*P*>|*z*|
Constant	1.1558	2.45	0.01
St. Dev. of ROAs	–3.7841	–1.28	0.20
Tobin's *Q*	0.1050	1.28	0.20
Investment level	0.1845	0.30	0.76
Firm-specific variation	–13.3277	–1.76	0.08
Systematic variation	7.6178	0.44	0.66
ROA year –3	–2.8195	–2.33	0.02
ROA year –2	–5.4948	–3.49	0.00
ROA year –1	–1.1826	–0.95	0.34
Number of segments	0.2986	5.25	0.00
Leverage	–0.7583	–1.20	0.23
Size	–0.1199	–2.18	0.03
N			327
Wald Statistic			31.85

Panel B: Second-stage OLS Estimation

	Δ ROA (+1,+2)		Δ ROA (+1,+3)	
	Reg. 1 (MM)	Reg. 2 (REBA)	Reg. 3 (MM)	Reg. 4 (REBA)
Intercept	–0.1068*	–0.0009	0.0221	0.1319*
	(–1.74)	(–0.02)	(0.26)	(1.65)
Lambda	–0.0096	0.0336**	–0.0772***	–0.0343
	(–0.49)	(1.96)	(–2.98)	(–1.34)
Δ Informativeness of stock price	5.1242***	1.4451**	5.3907***	1.3522*
	(4.20)	(2.45)	(3.35)	(1.87)
Pre-spinoff Informativeness	2.8686***	–1.2183	1.709	–4.0403**
	(2.59)	(–1.22)	(1.13)	(–2.40)
Δ Systematic variation	–1.5607		–1.2107	
	(–0.78)		(–0.47)	
Pre-spinoff systematic variation	0.0696		1.0283	
	(0.03)		(0.28)	
Δ Beta	0.0018	0.027**	0.0105	0.0409**
	(0.12)	(2.35)	(0.54)	(2.16)
Δ Leverage	0.0377	–0.0346	0.0863	–0.0795
	(0.61)	(–0.63)	(1.06)	(–0.99)
Size	0.0059	–0.0021	–0.0055	–0.0141*
	(0.92)	(–0.36)	(–0.62)	(–1.64)
Excess return	0.3110**	0.5133***	0.2639	0.6636***
	(2.15)	(3.77)	(1.33)	(3.31)

Table 9:

Corporate Focus and Spinoffs

Panel A reports changes in the industry-adjusted ROA from year +1 to year +2 and from year +1 to year +3 for focus-improving and non-focus-improving spinoffs. A spinoff is focus-improving if the parent and subsidiary have different two-digit SIC codes. A firm is excluded from the categorization if it spins off more than one subsidiary and one subsidiary has the same two-digit SIC code as the parent and the other s do not. The last row reports the difference in performance between focus-improving parents and non-focus-improving parents. Panel B presents changes in the industry-adjusted ROA for information-increasing and information-decreasing spinoffs. Two informativeness measures are used for the comparison: changes in the firm-specific return variation (MM) and changes in the relative effective bid-ask spread (REBA). Panel C reports regression results. The dependent variables are ROA (+1, +2) and ROA (+1, +3). Focus is an indicator variable that equals 1 for focus-improving spinoffs and 0 for non-focus-improving spinoffs. Regressions 2 and 5 employ the firm-specific return variation (MM) and regressions 3 and 6 use the REBA as the informativeness measure, respectively. *t*-statistics are in parentheses. White's heteroskedasticity-consistent standard errors are utilized for all regressions.

Panel A: Changes in Industry-adjusted ROA and Corporate Focus

	ROA(+1,+2)			ROA(+1,+3)		
	N	Mean	Median	*N*	Mean	Median
Focus-improving	141	0.0286**	0.0035*	127	0.0318*	0.0093
Non-focus-improving	86	0.0052	0.0004	67	–0.0170	–0.0051
Difference		0.0234	0.0031		0.0488*	0.0144

Panel B: Changes in Industry-adjusted ROA and Informativeness

	ROA(+1,+2)			ROA(+1,+3)		
	N	Mean	Median	*N*	Mean	Median
Firm-specific return variation (MM) as the information measure						
Information-increasing	152	0.0364**	0.0105**	129	0.0306	0.0101
Information-decreasing	89	–0.0171	–0.0068*	77	–0.0194	–0.0098
Difference		0.0535***	0.0173***		0.0500*	0.0199**
REBA as the information measure						
Information-increasing	113	0.0335	0.0014	97	0.0258	0.0093
Information-decreasing	71	–0.0096	–0.0002	55	–0.0328	–0.0098
Difference		0.0431**	0.0016*		0.0586**	0.0191*

Panel C: Regression Results

	Δ ROA (+1,+2)			Δ ROA (+1,+3)		
	Reg. 1	Reg. 2 (MM)	Reg. 3 (REBA)	Reg. 4	Reg. 5 (MM)	Reg. 6 (REBA)
Intercept	0.0225	–0.0756	0.0778	0.0112	–0.0017	0.1142
	(1.22)	(–1.22)	(1.02)	(0.51)	(–0.02)	(0.99)
Focus	–0.0070	–0.0019	0.0012	0.0125	–0.0042	–0.0049
	(–0.34)	(–0.11)	(0.06)	(0.45)	(–0.17)	(–0.17)
Δ Informativeness		3.9216**	2.1352**		4.2946**	1.3943**
		(2.18)	(1.94)		(2.04)	(2.08)
Pre-spinoff informativeness		2.6385	–0.7797		1.4064	–4.6427
		(1.45)	(–0.65)		(0.89)	(–1.46)
Δ Systematic variation		–2.0085			–1.6267	
		(–1.49)			(–0.86)	
Pre-spinoff sys. variation		–0.7761			0.1690	
		(–0.47)			(0.06)	
Δ Beta		0.0201	0.0483**		0.0300	0.0594**
		(1.19)	(2.35)		(1.46)	(2.40)
Δ Leverage		0.0236	–0.1221**		0.0562	–0.1124
		(0.33)	(–2.10)		(0.61)	(–1.46)
Size		0.0039	–0.0079		–0.0047	–0.0116
		(0.75)	(–0.92)		(–0.61)	(–1.03)
Excess return		–0.0557	–0.0448		0.1517	0.4085*
		(–0.27)	(–0.18)		(0.81)	(1.77)
N	218	199	153	184	168	132
Adj. R2	0.0006	0.1158	0.1373	0.0010	0.1145	0.1830

* Significant at the 0.10 level; ** Significance at the 0.05 level; *** Significance at the 0.01 level.

Table 10:

Operating Performance of Subsidiaries

Panel A reports raw ROA and industry-adjusted ROA of the spun-off subsidiaries from year –1 to year +3 excluding the year of the spinoff distribution. Panel B presents the correlations between the post-spinoff performance changes of parents and the pre-spinoff performance and the post-spinoff performance changes of subsidiaries.

Panel A: Operating Performance of Subsidiary Firms from Year –1 to Year +3

	ROA			Industry-adjusted ROA		
	N	Mean	Median	*N*	Mean	Median
Year –1	157	–0.0939	0.1376	147	–0.2218	0.0253
Year +1	223	0.0908	0.1248	202	0.0475	0.0133
Year +2	206	0.0748	0.1228	186	–0.0209	–0.0068
Year +3	187	0.0794	0.1153	158	–0.0444**	–0.0061

Panel B: Correlations between Operating Performance of Parents and Subsidiaries

	Δ ROA (+1,+2) of parent	Δ ROA (+1,+3) of parent
ROA (Year –1) of subsidiary	0.0202	–0.0329
Δ ROA (+1,+2) of subsidiary	–0.0411	–0.0375
Δ ROA (+1,+3) of subsidiary	0.0481	0.0645

** Significant at the 0.05 level.

Table 11:

Compensation Structure and Operating Performance

The dependent variables are changes in industry-adjusted ROA of parent firms from year +1 to +2 and from year +1 to year +3, where year 0 is defined as the year of spinoff distribution. Each of the two compensation structure measures is used as an independent variable, respectively. Informativeness measure utilized is firm-specific return variation (MM). Control variables include changes in informativeness, pre-spinoff level of informativeness, change in leverage from year −1 to year +1, change in beta (a coefficient of market return variable in market model regression), size (log of total assets in the first fiscal year after spinoff distributions), and 3-day excess return around spinoff announcements. Leverage is calculated by dividing total debt by total assets, where total debt is the sum of long-term debt and debt in current liabilities. Excess return is calculated using market model and value-weighted market returns. *t*-statistics are in parentheses. White's heteroskedasticity-consistent standard errors are utilized for all regressions.

Panel A: Univariate Analysis

	ROA(1, 2)		ROA(1, 3)	
	ΔComp.< 0	ΔComp.≥ 0	ΔComp.< 0	ΔComp.≥ 0
SBC	-0.00011	0.00242	-0.00804	0.00737
Delta	0.00618	0.00023	-0.00230	0.01096
Stockholding	0.00172	-0.00016	0.00583	-0.00280
Ownership	-0.00097	0.00199	-0.01268	0.00861

Panel B: Multivariate Analysis

	ΔROA (1, 2)		ΔROA (1, 3)	
	Reg. 1 (SBC)	Reg. 2 (Delta)	Reg. 3 (SBC)	Reg. 4 (Delta)
Intercept	-0.0251	-0.0132	-0.0364	-0.0352
	(-0.57)	(-0.24)	(-0.51)	(-0.43)
Δ Compensation	0.0585*	-0.3019	0.1080**	-0.1182
	(1.71)	(-0.78)	(2.05)	(-0.32)
Δ Informativeness	3.6918**	4.8222**	4.7614**	4.3706*
	(1.97)	(2.07)	(2.26)	(1.70)
Pre-spinoff Comp.	3.4978*	5.4263**	4.8877**	4.7210*
	(1.85)	(2.30)	(2.38)	(1.75)
Δ Leverage	0.0398	0.0116	0.0617	0.0730
	(0.51)	(0.14)	(0.73)	(0.77)
Δ Beta	-0.0218	-0.0318	-0.0510*	-0.0622
	(-1.21)	(-1.28)	(-1.73)	(-1.33)
Size	-0.0018	-0.0061	-0.0016	0.0012
	(-0.39)	(-0.87)	(-0.22)	(0.14)
Excess Return	-0.1245	-0.0665	0.0740	0.1559
	(-0.56)	(-0.27)	(0.28)	(0.49)
Adj. R-sqr.	0.0926	0.1452	0.0782	0.0339
N	158	111	133	96

* Significant at the 0.10 level; ** Significant at the 0.05 level.

Table 12:

Regressions including an interaction term between Compensation Structure and Informativeness

The dependent variables are changes in industry-adjusted ROA of parent firms from year +1 to +2 and from year +1 to year +3, where year 0 is defined as the year of spinoff distribution. Each of the two compensation structure measures is used as an independent variable, respectively. ΔInfo·ΔComp is the product of a compensation variable and an informativeness variable. Informativeness measure utilized is firm-specific return variation (MM). Control variables include changes in informativeness, pre-spinoff level of informativeness, change in leverage from year −1 to year +1, change in beta (a coefficient of market return variable in market model regression), size (log of total assets in the first fiscal year after spinoff distributions), and 3-day excess return around spinoff announcements. Leverage is calculated by dividing total debt by total assets, where total debt is the sum of long-term debt and debt in current liabilities. Excess return is calculated using market model and value-weighted market returns. *t*-statistics are in parentheses. White's heteroskedasticity-consistent standard errors are utilized for all regressions.

	ΔROA (1, 2)		ΔROA (1, 3)	
	Reg. 1 (SBC)	Reg. 2 (Delta)	Reg. 3 (SBC)	Reg. 4 (Delta)
Intercept	-0.0435	-0.0080	-0.0971	-0.0240
	(-0.73)	(-0.14)	(-1.20)	(-0.28)
Δ Compensation	0.0353	0.8000	0.1031*	-1.9860
	(1.22)	(0.94)	(1.68)	(-1.45)
Δ Info·Δ Comp	1.7536	-112.6570	-7.5228	192.6020
	(0.41)	(-1.36)	(-1.13)	(1.23)
Pre-spinoff Compensation	-0.0448	-0.8200	-0.0928	-5.1990
	(-0.82)	(-0.31)	(-1.45)	(-1.55)
Δ Informativeness	3.7416*	4.5030*	5.4092**	5.0570*
	(1.86)	(1.81)	(2.37)	(1.91)
Pre-spinoff Informativeness	3.7672*	5.4170**	5.9047**	5.3500**
	(1.73)	(2.19)	(2.55)	(1.98)
Δ Leverage	0.0366	0.0160	0.0623	0.0750
	(0.47)	(0.19)	(0.75)	(0.80)
Δ Beta	-0.0173	-0.0370	-0.0433	-0.0630
	(-0.94)	(-1.53)	(-1.52)	(-1.42)
Size	0.0009	-0.0060	0.0056	-0.0020
	(0.16)	(-0.69)	(0.72)	(-0.17)
Excess Return	-0.1192	-0.0660	0.0968	0.1930
	(-0.55)	(-0.27)	(0.37)	(0.61)
Adj. R-sqr.	0.0863	0.1450	0.0814	0.0358
N	158	111	133	96

* Significant at the 0.10 level; ** Significant at the 0.05 level.

Table 13:

Robustness Checks Using Additional Measures

Panel A: Summary statistics: performance-sensitive wealth measures

	N	Mean	Min	Q1	Median	Q3	Max
Stockholding							
pre-spinoff	194	74.34	0.02	1.12	4.07	14.46	7513.29
post spinoff	208	61.25	0.00	0.76	2.21	7.32	5827.14
changes	190	-10.95	-1686.15	-4.28	-0.45**	0.83	1865.78
Ownership							
pre-spinoff	194	0.04123	0.00001	0.00104	0.00423	0.02699	0.82045
post spinoff	209	0.03154	0.00000	0.00078	0.00334	0.01996	0.50557
changes	191	-0.01095**	-0.68008	-0.00574	-0.00018	0.00083	0.19439

Panel B: Multivariate regression results

	ΔROA (1, 2)		ΔROA (1, 3)	
	Reg. 1 (Stockholding)	Reg. 2 (Ownership)	Reg. 3 (Stockholding)	Reg. 4 (Ownership)
Intercept	-0.0325	-0.0386	-0.0664	-0.0670
	(-0.70)	(-0.79)	(-0.89)	(-0.88)
Δ Compensation	-0.0005	-0.3991	-0.0005	-0.5134
	(-1.18)	(-0.96)	(-1.05)	(-0.96)
Δ Informativeness	3.8164**	3.8997**	4.2228**	3.9089**
	(2.13)	(2.12)	(2.15)	(2.32)
Pre-spinoff Comp.	4.0695**	3.7149*	3.8379**	3.3437**
	(2.05)	(1.99)	(2.07)	(2.15)
Δ Leverage	0.0147	0.0200	0.0545	0.0565
	(0.24)	(0.32)	(0.86)	(0.86)
Δ Beta	-0.0309*	-0.0232	-0.0481	-0.0437
	(-1.76)	(-1.36)	(-1.63)	(-1.54)
Size	-0.0004	-0.0002	0.0048	0.0056
	(-0.10)	(-0.03)	(0.68)	(0.78)
Excess Return	-0.1162	-0.1302	0.1680	0.0968
	(-0.51)	(-0.58)	(0.65)	(0.41)
Adj. R-sqr.	0.1355	0.1265	0.0577	0.0727
N	153	153	129	131

* Significant at the 0.10 level; ** Significant at the 0.05 level.

Figure 1:

Sequence of Events

Change in informativeness is post-spinoff informativeness minus pre-spinoff informativeness. ROA (+1, +2) and ROA (+1, +3) are changes in operating performance and are measured by ROA for year +2 minus ROA year +1 and ROA year +3 minus ROA year +1, respectively.

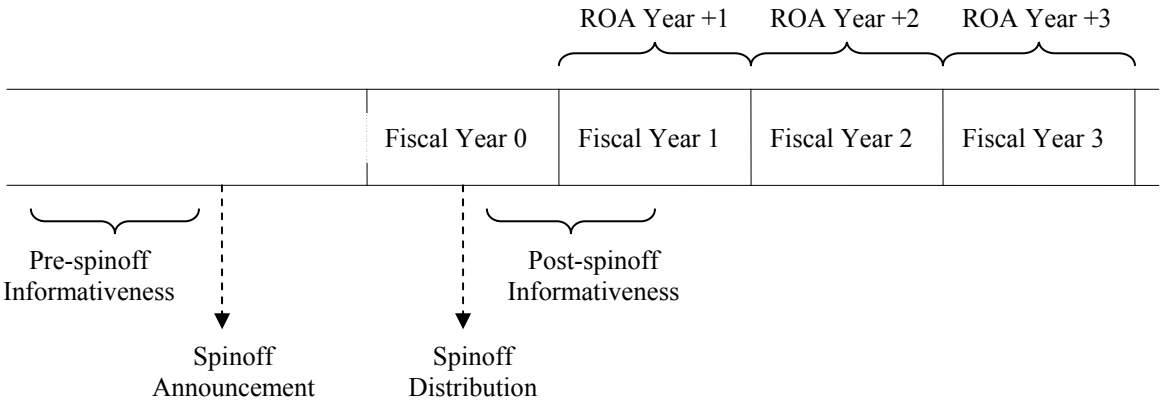


Figure 2:

Performance Changes for Quartiles sorted by Changes in Informativeness

Figure 2 shows median changes in informativeness around the spinoff and median changes in industry-adjusted operating performance from year +1 to year +3 for each quartile. Sample firms are sorted into four quartiles based on the magnitude of changes in informativeness, with quartile 1 corresponding to the firms experiencing the least improvement in informativeness around the spinoff. The firm-specific return variation (MM) is utilized as the informativeness measure.

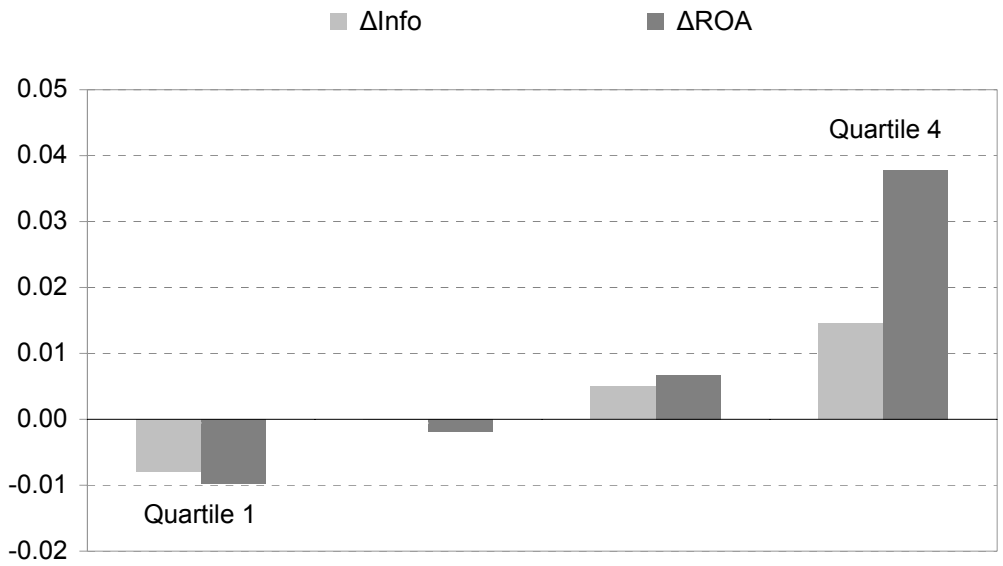


Figure 3:

CEO Compensation

Following figures show the distribution of compensation and stock holding over time. All dollar values are converted to 1995 dollar values. Due to the strong right skewness of the data, median values are reported unless specified otherwise.

Figure 3A: Median annual compensation (unit: $thou)

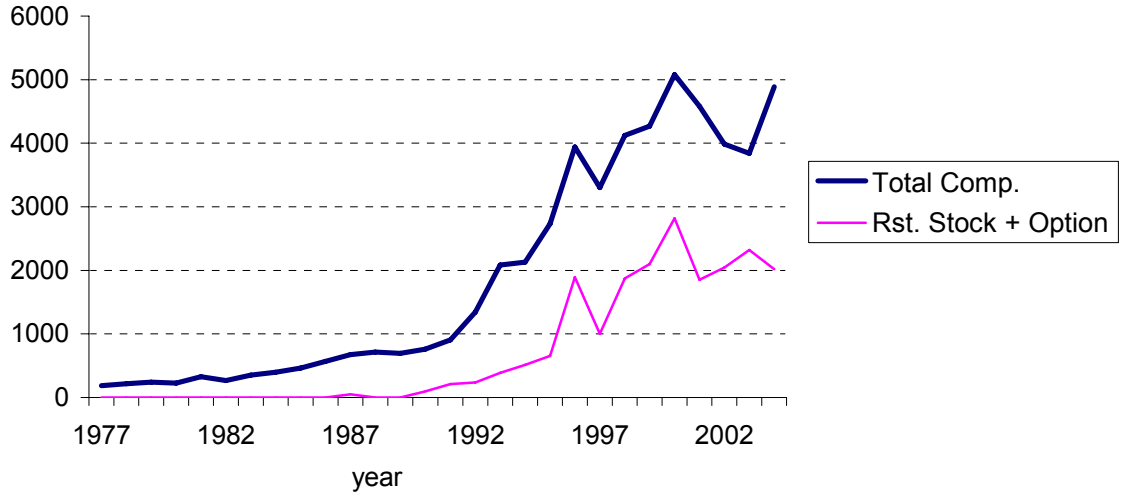


Figure 3B: Frequency of stock compensation

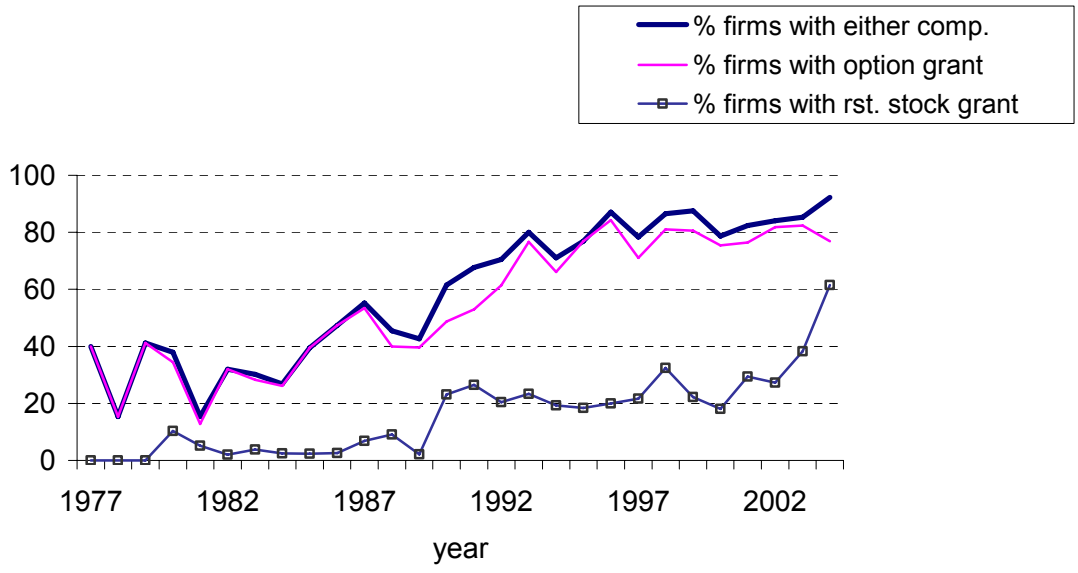
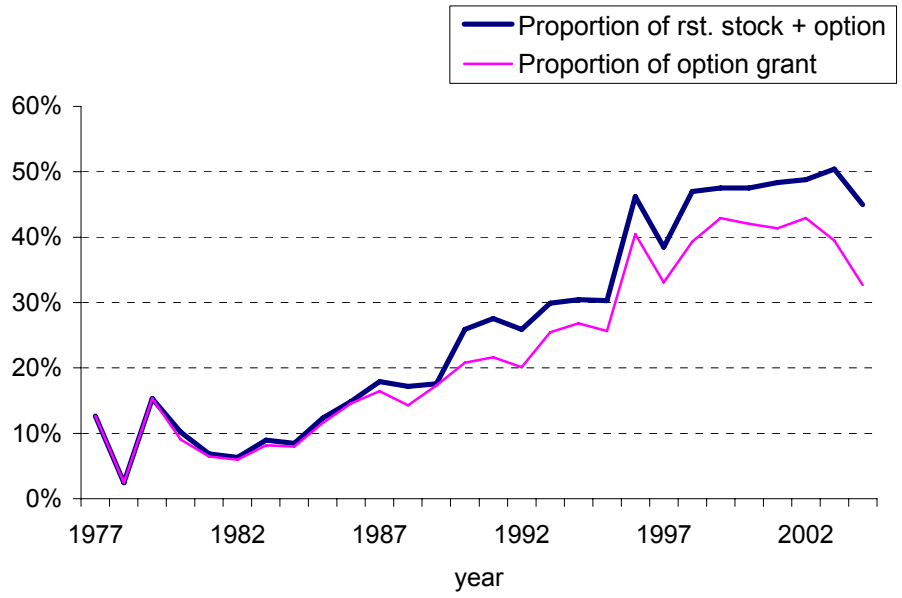


Figure 3C: Proportion of stock compensation (mean)



Appendix:

Variable Definitions

Variable	Measure
Systematic Variation	Standard deviation of the return variations explained by market return (and industry return)
Beta	Coefficient of the market return variable in market model regressions
Leverage	Total debt divided by total assets, where total debt is the sum of long-term debt and debt in current liabilities.
Size	Log of the total assets of a parent firm at the end of the month of the spinoff distribution
Excess Return	3-day announcement period abnormal return (estimated using market model and value-weighted market return)
Return on asset (ROA)	Operating cash flow (COMPUSTAT annual data item #13) divided by total assets (COMPUSTAT annual data item #6)
Tobin's Average Q	Market value of total assets divided by book value of total assets, where market value of total assets is book value of total assets plus market value of common equity minus book value of common equity minus deferred taxes.
Investments (I)	Capital expenditure divided by sales (Capital expenditure divided by total assets is also used as a measure of investment. Test results are similar to those using capital expenditure divided by sales and are not reported here.)

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