

CHANGE IN PARENT'S COST OF EQUITY CAPITAL AROUND EQUITY CARVE-OUT

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Abstract

Equity carve-out transactions typically result in greater disclosure and more analysts following. Does this change in information environment affect the parent firm's cost of capital? Having a sample of 142 equity carve-out transactions completed between 1982 and 1997, I examine this question by estimating their cost of equity with a residual income model. The results show that the average cost of equity of parent firms declines by about 64 basis points after carve-outs, after controlling for changes in financial leverage and risk-free rate. This decline in the cost of equity is greater for multi-divisional firms. Equity carve-outs that create pure-plays result in a larger decline in the cost of equity. Furthermore, the greater the increase in analyst following, the larger is the decline in the cost of equity around carve-outs. Overall these results imply that reduction in information asymmetry surrounding equity carve-outs is a key reason for the decline in cost of external financing. The major contribution of this paper is to show that it is the decline in the cost of equity, rather than an expected improvement in future earnings, that generates value for parent firms in equity carve-out transactions.

Keywords: Equity Carve-outs, Corporate Restructuring, Residual Income Model, Unlevered Excess Cost of Equity

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1. Introduction

Equity carve-outs are corporate restructuring transactions that create well defined equity claims on business units. Previous studies show that equity carve-outs are value creating transactions for the parent firms. Schipper and Smith (1983) examine a sample of 76 equity carve-outs during 1963-1984 and find an average excess return of 1.83% around the announcement dates. Similarly, Allen and McConnell (1998) and Vijh (2002) observe a similar magnitude of excess return with a sample of equity carve-outs announced after 1980's.

The above results imply two possible sources of positive valuation effects. The first possibility is that carve-out transactions increase expected future cash flows. The second is that carve-out transactions reduce the expected cost of equity. Of course, both

may exist at the same time. The first possibility is rejected by Haushalter and Mikkelson (2001) and Powers (2003), both of which examine the operating performance of parent firms and find no significant improvement in cash flows subsequent to carve-outs.

Therefore, the objective of this study is to examine the second possibility. Equity carve-out can reduce parent's cost of equity for several reasons. First, after equity carve-out, the carved-out unit provides independent audited financial statements for their shareholders. As a result, investors have greater access to information about future cash flows of the parent firm. The improvement in annual report disclosure reduces estimation risk for the parameters of an asset's payoff thus leading to a lower cost of equity capital (Botosan, 1997; Botosan and Plumlee, 2000). Second, equity carve-out attracts more analyst coverage which also improves the information

environment for investors (Gilson et al, 2001). Consistent with these reasons, many corporate managers cite “unlocking hidden values” as a key motivation for carve-outs. They usually suggest that by carving out equity in a subsidiary, they improve the valuations of these assets. Third, equity carve-out make transactions between the parent and divested unit more transparent. Otherwise, if the parent wholly owns the subsidiary or maintains a majority ownership, internal resource allocations and transfer pricing arrangements between the parents and subsidiaries are nontransparent and investors are uncertain about the true value of assets.

Another objective of this paper is to find out the factors that determine the magnitude of the reduction in the cost of equity. First, the reduction should be higher if investors anticipate the parent to completely divest the carved out unit in a subsequent transaction. Equity carve-out is usually the first stage of a complete divestiture (Klein, Rosenfeld and Beranek, 1991; Perotti and Rossetto, 2007). I expect that if the divestiture is partially done, informational and transactional uncertainties are not completely resolved. On the other hand, if the market expects the parent to completely divest the carved out unit in a second stage transaction, the informational and transactional uncertainties would be completely resolved. Second, I expect the decline in the cost of equity to be larger for firms with multiple lines of business. Since intra-firm transactions generally increase with the number of segments a firm operates, it is difficult to value a firm if it operates in too many different lines of businesses. As a result, the benefits from equity carve-outs will be larger more complex firms.

In the empirical implementation of these tests, the cost of equity is estimated around carve-outs using a residual income model by Gebhardt, Lee and Swaminathan (2001). The residual income model has an advantage over the market model in estimating the cost of equity in that it allows for the use of analysts’ forecast information (as against using historical data to estimate parameters for the estimation model). Besides, Fama and French (1997) suggest that a firm’s realized stock return is a poor proxy for its cost of equity capital.¹

¹ Similar models to estimate the cost of equity with earnings forecasts include models by Ohlson and Juettner-Nauroth (2005), Claus and Thomas (2001) and Easton (2004). Compared with the other two models, the models by Gebhardt, Lee and Swaminathan (2001) and Claus and Thomas (2001) incorporate more abundant information in estimating the cost of equity. Specifically, both models incorporate long-term growth forecasts to project explicitly the medium-term (3 to 5 years forward) profitability. Thus, the cost of equity estimates by these two models should be more informative. Gode and Mohanram (2003) test Ohlson-Juettner Model against Gebhardt-Lee-Swaminathan Model and find that the cost of equity

For this study, I calculate an *unlevered* cost of equity instead of the raw cost of equity from the residual income model because many parent firms use the proceeds of carve-outs to repay debt. A change in capital structure surrounding carve-out transactions would result in mechanical changes in the levered cost of equity. To disentangle the effect of leverage-based changes from the information-based changes in the cost of equity, the estimated cost of equity from the residual income model is unlevered using Modigliani and Miller’s Proposition 2. The *unlevered* cost of equity is then further adjusted for the risk-free rate to get *unlevered* excess cost of equity.

Using a sample of 142 equity carve-outs between 1982 and 1997, I find that the *unlevered* excess cost of equity of parent firms reduces by 64 basis points around equity carve-outs. More importantly, the reduction in the cost of equity is significantly related to the announcement returns. This suggests that the positive stock market reaction to equity carve-outs reflects an anticipated decline in the cost of equity around these transactions.

Consistent with Haushalter and Mikkelson (2001) and Powers (2003), I also find no significant improvement in forecasted profitability around equity carve-out. In other words, financial analysts also do not expect a higher growth rate in the parent’s long-term earnings. Thus, improvement in earnings is unlikely to be the source of value creation from carve-out transactions.

The additional results from the analysis are as follows:

1. The reduction in the cost of equity is larger when more financial analysts follow the parent firms, consistent with the informational role of financial analysts in the stock market.
2. Equity carve-outs motivated by pure-play reasons result in a larger reduction in the cost of equity.
3. Equity carve-outs by parents with at least four business segments result in a larger reduction in the cost of equity compared to those done by parents operating fewer than four segments.
4. Finally, the reduction in the cost of equity is higher when parent firms subsequently dispose their remaining interests in the carved-out units.

The remainder of this paper is organized as follows. Section 2 provides a literature review. Section 3 describes the variable construction. Section 4 describes sampling procedures. Section 5 reports univariate test results for change in the cost of equity on changes in forecasted profitability and estimation risk. Section 6 and Section 7 report the correlation

estimates from the latter model better explain future stock returns than the former. Examining G-7 countries, Pástor, Sinha, and Swaminathan (2008) find a positive relation between the conditional mean and variance of stock returns at both country and world market levels, confirming a trade-off between risk and return.

and regression analysis for change in the cost of equity. Section 8 concludes.

2. Literature Review and Hypotheses Development

Schipper and Smith (1986) document that equity carve-outs are wealth-increasing events for shareholders of parent firms. The positive stock price reaction could come from an improved access to external capital markets for both parent and their subsidiaries (Nanda, 1991), from better valuations (Schipper and Smith, 1986; Gilson et al, 2001), or from being able to write better managerial incentive contracts (Holmstrom and Tirole, 1993).

In this paper, I focus on the valuation perspective. Previous studies generally agree that if the disclosure of a firm is improved, its cost of equity should drop. Barry and Brown (1985), Handa and Linn (1993), and Coles, Loewenstein and Suay (1995) conclude that under a general equilibrium setting, low-information assets (i.e. high information risk) have lower prices and earn higher expected returns than high-information assets. Consistent with the disclosure hypothesis, Botosan (1997) and Botosan and Plumlee (2002) find that the cost of equity is decreasing with annual report disclosure level. Besides, Botosan finds that the disclosure effect on the cost of equity is less important among firms with higher analyst coverage.

Previous studies also suggest that corporate divestitures improve information flow thus creating value for the divesting firms. Creating a public market for a subsidiary can attract more analysts to collect, process and disseminate information to investors and thus reduce estimation risk. For example, Gilson et al (2001) argue that after equity

$$P_t = B_t + \frac{FROE_{t+1} - r_e}{1 + r_e} B_t + \frac{FROE_{t+2} - r_e}{(1 + r_e)^2} B_{t+1} + TV$$

where TV is given by

$$TV = \sum_{i=3}^{12-1} \frac{FROE_{t+i} - r_e}{(1 + r_e)^i} B_{t+i-1} + \frac{FROE_{t+12} - r_e}{r_e (1 + r_e)^{12-1}} B_{t+12-1}$$

The variables are defined as follows:

B_t : book value of equity per share in last fiscal year end (fiscal year t). It is defined as book value of common equity (Compustat annual item #60) divided by the number of common shares outstanding from I/B/E/S in the estimation month, i.e. month -3 relative to the end of current fiscal year. If the number of shares outstanding in I/B/E/S is missing, the number from Compustat PDE file, adjusted for cumulative adjustment factor, is used instead.

B_{t+i} : forecast book value of equity per share for fiscal year $t+i$. It is given by the relationship $B_{t+i} = B_{t+i-1} + FEPS_{t+i} - FDPS_{t+i}$, where $FEPS_{t+i}$ is the I/B/E/S mean earnings per

carve-out, brokerage houses can have more appropriate industry specialists to follow the divested unit, with other analysts to follow the remaining businesses of parent firm. Therefore, the availability of separate financial statements and publicly traded carve-out equity improves their ability to assess the value of the parent firm, and the parent's cost of equity should reduce after the transaction.

The importance of estimation risk on cost of capital is further confirmed by the stated motivations of equity carve-outs by the managers of parent firms. A desire to refocus and to create pure plays is a commonly cited motivation for equity carve-outs. In addition, Vijh (2002) finds that stock market reacts more positively when managers state resolving complexity or unlocking hidden value as a motivation for the transactions. In some cases, the managers explicitly state that they carve out some business units because investors cannot recognize the fair values of parts of the businesses of their firms. Thus, I expect parent firms will experience a greater decline in the cost of equity if their transactions are motivated by unlocking hidden value or resolving complexity.

3. Empirical Methodology and Construction of Variables

3.1 Analysts forecasts and cost of equity estimation

Frankel and Lee (1998), and Gebhardt, Lee and Swaminathan (2001) outline a procedure to estimate the cost of equity of a firm (All the forecast data and stock prices are taken as of month -3 relative to the end of current fiscal year (fiscal year $t+1$)). Specifically, the cost of equity (r_e) is estimated based on the following relation:

share (EPS) forecast for fiscal year $t+i$. In most cases, I/B/E/S provides mean EPS forecasts only for fiscal years $t+1$ and $t+2$ but it also provides a forecast for long-term EPS growth rate (LTG) which "generally represents an expected annual increase in operating earnings over the company's next full business cycle... (and) refers to a period of between three to five years" (the I/B/E/S Glossary). Following Frankel and Lee (1998), and Gebhardt, Lee and Swaminathan (2001), EPS forecast in fiscal year $t+3$ is estimated as $FEPS_{t+3} = FEPS_{t+2}(1+LTG)$. For

firms with a negative $FEPS_{t+2}$, $FEPS_{t+3}$ is assumed to be zero.²

$FDPS_{t+i}$ is the forecast dividend per share for fiscal year $t+i$, given by $FDPS_{t+i} = FEPS_{t+i} \times k$, where k is dividend payout ratio in fiscal year t , defined as common dividends (#21) divided by the excess of income before extraordinary items (#18) over preferred dividends (#19). Dividend payout ratio is restricted to be between zero and one. Payout ratios higher than one will be assumed to be one and loss-making firms are assumed to have payout ratios equal to zero. The purpose of forcing payout ratios to be smaller than one is to avoid the book value of equity shrinking over time. For firms with negative earnings, payout ratios are meaningless. I suppose payout ratios of those firms to be zero because they normally have lower ability to pay dividends than other firms that make profits.

$FROE_{t+i}$: forecasted profitability for fiscal year $t+i$. For the first three fiscal years, $FROE_{t+i}$ is

estimated as $\frac{FEPS_{t+i}}{B_{t+i-1}}$. $FROE_{t+12}$ is equal to

industry target profitability. Between year $t+3$ and year $t+12$, $FROEs$ are estimated using a linear interpolation to the industry target profitability. For example, if $FROE_3$ equals 15% and $FROE_{12}$ equals 6%, $FROE_4$ will equal 14%, $FROE_5$ will equal 13% and so on. Once $FROE$ for a year is estimated, $FEPSs$ after fiscal year $t+3$ can be calculated according to the relation $FROE_{t+i} = \frac{FEPS_{t+i}}{B_{t+i-1}}$.

To calculate industry target profitability, firm-level profitability is first calculated by dividing the difference between net income (#18) and preferred dividends (#19) by lagged one-period book value of common equity (#60). Then, for every year, industry-median profitability is calculated for all profitable firms in the same 2-digit SIC industry. Finally, industry target profitability is calculated as the moving average of industry-median $ROEs$ in the past 10 years (or a minimum of 5 years if time-series of data is not long enough).

To eliminate the extreme values, parent firms with the estimated cost of equity (r_e) higher than 30% or lower than 1% in year -1 or year 0 are excluded for the sample.³ In addition, to make the estimates of the cost of equity comparable over time, there are two factors that have to be controlled for. The first factor is the change in leverage as a result of an equity

carve-out. Some firms repay their debt out of the carve-out proceeds thus lowering their levered cost of equity. To purge these leverage effects from the estimated cost of equity, the remainder of the analysis focused on the *unlevered* cost of equity. Modigliani and Miller's Proposition 2 provides the following relation between levered cost of equity, r_e , and *unlevered* cost of equity, r_0 :

$$r_e = r_0 + \frac{D}{E}(1 - T_c)(r_0 - r_d),$$

where E is the market capitalization as of the month end of the cost of equity estimation, D is the book-value of debt as of fiscal year 0, T_c is the top statutory corporate tax rate and r_d is the Moody's yield of Baa grade corporate bonds.⁴ If reduction in financial leverage is the only force that drives a change in the cost of equity, the *unlevered* cost of equity should remain unchanged after equity carve-outs.

The second factor that should be controlled for is time-series fluctuation of interest rates. The *unlevered* cost of equity estimated above is subtracted by the yield of 3-month T-bill to get *unlevered* excess cost of equity.⁵ In the following, the *unlevered* excess cost of equity will be the focus of most parts of analysis unless it is specified otherwise.

3.2 Proxies for estimation risk

Gilson et al. (2001) show that analyst coverage increases and analysts' EPS forecast errors reduce for divesting firms after corporate divestiture transactions, suggesting financial analysts make more accurate EPS forecasts for divesting firms because of more information disclosure. If financial analysts provide investors with useful information for valuation, change in the *unlevered* excess cost of equity will be positively related to change in dispersion of EPS forecasts and negatively related to change in analyst coverage. Forecast dispersion is defined as the standard deviation of current-year EPS forecasts, scaled by the stock price in the estimation month. Analyst coverage is defined as the total number of current-year EPS forecasts for the parent firm and carved-out unit in the estimation month.

Estimation risk is also affected by firm complexity. Vijh (1999) shows that the long-term

² Only one observation is affected by this treatment in each of year -1 and year 0. Actually, Frankel and Lee (1998), and Gebhardt, Lee and Swaminathan (2000) do not provide the treatment of companies which have negative forecast earnings for next two years.

³ The results in this paper are qualitatively the same without this restriction.

⁴ Another way to estimate cost of debt is to take the ratio between interest expenses and the book value of debt at the end of previous fiscal year. However, this method sometimes generates extremely large values for the cost of debt. Thus, I winsorize the cost of debt estimates at 0% and 25% on both sides. For an unreported analysis, I estimate the unlevered cost of equity with this new cost of debt and repeat the analyses in this paper. The findings are qualitatively the same as those presented in this paper.

⁵ The results in this paper are qualitatively the same if the yield of 10-year T-note is used as the risk-free rate.

stock returns of parent firms increase with the number of business segments they operate in prior to carve-outs. Thus, equity carve-outs provide greater benefits to parents with more complex business mix. Uncertainty typically increases when the level of intra-firm transactions increases because of internal resource allocations among business units. Thus, I divide parent firms into two groups: (1) firms that operate at least four business segments and (2) firms that operate fewer than four segments. The classification is based on the business segment data from Compustat Business Information File. Cross-group comparison for the change in the *unlevered* excess cost of equity is performed in Section 5. If estimation risk increases with firm complexity, more complex parent firms should have a larger reduction in the *unlevered* excess cost of equity.

Vijh (2002) examines various sources of divestiture gains from equity carve-outs. He shows that stock market reacts more positively when managers state resolving complexity or unlocking hidden value as a motivation for the transactions. If the source of value creation comes mainly from unlocking hidden value, the decline in the cost of equity will be larger for the group of equity carve-outs motivated by pure-play reasons. News articles surrounding carve-out announcements are read to determine motivations. Cross-group comparisons of

change in the *unlevered* excess cost of equity are performed in Section 5.

4. Sample Selection

Equity carve-outs filed between 1982 and 1997 are obtained from the Thomson Financial SDC Platinum database. Firms not listed on the Compustat database, firms with insufficient data, and those with missing analysts' earnings forecasts on the I/B/E/S summary history file are excluded. In addition, equity carve-outs by firms in financial industries (SIC 6000-6999), parents domiciled in foreign countries, and parents without common shares (CUSIP issue code 10 or 11) listed are also excluded. Finally, five transactions with data errors are excluded. My final sample consists of 142 equity carve-out transactions.

Table 1 reports time and industry distribution of the sample equity carve-outs. The frequency of carve-out transactions shows some clustering in 1985-1987 and in 1993-1996. The announcement dates are checked against the Dow Jones Newswires. The date on which a firm first mentions its intention to issue a subsidiary's stock is recorded as the announcement date. If no prior announcement is found, the filing date from the newspaper article or the filing date from Thomson's database is used as the announcement date.

Table 1. Time and industry distribution of parent firms of equity carve-outs completed between 1982 and 1997

The sample of parent firms of equity carve-outs during 1982 and 1997 is obtained from Securities Data Corporation and satisfies the additional requirements that stock return and financial data can be obtained from CRSP and Compustat and that financial analysts' forecast data can be obtained from I/B/E/S Summary History file. Financial institutions (SIC 6000-6999), parents domiciled in foreign countries and parents with CUSIP issue codes other than 10 or 11 are excluded from the sample. The final sample consists of 142 equity carve-outs.

Panel A reports the number of equity carve-outs by filing years. Panel B reports the number of equity carve-outs by 2-digit SIC codes. Only industries with at least five equity carve-outs are reported separately.

Panel A: Distribution by filing years		
Year	Number of Equity Carve-outs	Percentage
1982	1	0.70%
1983	8	5.63%
1984	1	0.70%
1985	13	9.15%
1986	15	10.56%
1987	11	7.75%
1988	6	4.23%
1989	6	4.23%
1990	4	2.82%
1991	8	5.63%
1992	7	4.93%
1993	15	10.56%
1994	12	8.45%
1995	8	5.63%
1996	22	15.49%
1997	5	3.52%

Total	142	100.00%
Panel B: Distribution by 2-digit SIC industries		
Primary Industry of Parents	2-Digit SIC Code	Number of Companies
Oil & Gas Extraction	13	5
Chemical & allied	28	15
Electronic, other electric equip	36	7
Measurement instruments	38	13
Railroad Transportation	40	6
Communications	48	7
Utilities	49	8
Non-durable goods-wholesale	51	8
Miscellaneous Retail	59	5
Business services	73	6
Others		62
Total		142

Other information about the transaction is also obtained from the news articles. Specifically, the articles are the source for the stated motivation of the transaction and the use of proceeds, in particular whether the parent firm receives proceeds from the transaction. Stated motivations are classified into three major categories: (i) restructuring, (ii) creating pure-plays and (iii) improving incentives. Restructuring motivations include refocusing to core businesses, restructuring of operations, and hints on subsequent divestitures of the carved-out units. Pure-play motivations include investors' failure to recognize the values of individual businesses, and unlocking hidden values. Incentive motivations include creating incentive pay for managers, alignment of managers' incentive, and so on. In 73 of 142 equity carve-outs, the parent firms cite at least one of the restructuring, pure-play, and incentive motivations for the transactions. Since a firm may state more than one motivation for its carve-out, individual numbers do not add up to 73. In addition,

in 71 transactions, the parent firms or the carved-out units indicate the use of proceeds from offerings to repay existing debt.

I also follow the announcements for corporate events of parent firms and carved-out units in a three-year period after equity carve-outs. These subsequent events are classified into five categories: (1) spin-offs; (2) sell-offs in which the carved-out units are sold to third parties; (3) public offerings in which the parent firms sell part/all of their remaining ownership through public offerings; (4) re-acquisitions in which a parent repurchases the equity of the carved-out units; and (5) parent firms being acquired by other parties.

Panel B of Table 2 reports the distribution of post-carve-out events. In 80 cases, parent firms propose at least one of the five events after equity carve-outs. Among the 80 transactions, in 68 cases, the parent firms propose to dispose the carved-out units through spin-offs, sell-offs or public offerings.

Table 2. Summary of motivations for equity carve-outs and post-carve-out events

Information comes from new announcements extracted from Dow Jones Newswires. The search of newswires is limited to a period from one year before an equity carve-out filing to three years after offering of subsidiary's shares. Panel A reports the motivations for equity carve-outs and Panel B reports post-carve-out events. In some cases, the parent firms may give more than one motivations for their transactions and announce more than one post-carve-out events as listed on the table.

Panel A Motivations for Equity Carve-outs	
(1) Firms mentioned refocusing or restructuring reasons for carve-outs	48
<i>(1a) Refocusing or reinvesting proceeds to core businesses</i>	
<i>(1b) Hints of subsequent spin-offs or disposals</i>	
<i>(1c) Restructuring of operations</i>	
(2) Firms mentioned pure-play or undervaluation reasons for carve-outs	31
<i>(2a) Unlocking hidden values</i>	
<i>(2b) Market failed to recognize the full values of individual businesses</i>	
<i>(2c) Undervalued subsidiaries</i>	
<i>(2d) Creating pure play stocks</i>	
(3) Firms mentioned managerial incentive reasons for carve-outs	4

(3a) Creating incentive pay for managers
 (3b) Improving incentive / compensation plans

Restructuring or pure-play or incentive reasons	73
Number of cases in which proceeds are used to repay existing debt	71
Panel B Post-carve-out Events	
(1) Number of parents announced spinning off the subsidiaries	28
(2) Number of parents announced disposal of subsidiaries to a third party	35
(3) Number of parents announced public offerings of carve-out units	11
(4) Number of parents announced reacquisition of subsidiaries	11
(5) Number of parents being acquired by other companies	9
Number of cases in which disposal events (1, 2 or 3) are announced	68
Number of cases in which second events (1, 2, 3, 4 or 5) are announced	80

5. Univariate Analysis

For the purpose of the following analysis, year -1 is defined as the fiscal year ended between month -9 to month +2 relative to the carve-out announcement and year 0 is the fiscal year ended between month 0 to month +11 relative to the equity offering of the subsidiary. The purpose of defining year -1 in such a way is to make sure that analysts' forecasts are made before carve-out announcements. If a proposed equity carve-out is postponed, the postponement date is used instead of offering date. Following Benveniste et al (2003), if the postponement date is unknown, it is assumed to be the 270th day after the carve-out filing.

5.1 Time-series patterns of unlevered excess cost of equity and its underlying parameters

Previous studies show that stock market react positively to carve-out announcements, suggesting equity carve-outs create value for shareholders of parent firms. However, the value may come from a reduction in the cost of equity or an increase in expected future cash flows, or both sources. To identify the major sources of valuation effects, Table 3 reports time-series patterns of yearly changes in individual elements of the residual income models, including the *unlevered* excess cost of equity and other key variables.

As predicted, the average cost of equity declines by 1.03% in the carve-out year. Since the cost of equity is affected by both changes in leverage and interest rates, I focus on the *unlevered* excess cost of equity. The average *unlevered* excess cost of equity

of parent firms also drops significantly around in carve-out year but does not change in other years. This shows that the reduction in the cost of equity in the carve-out year is only partly driven by a reduction in financial leverage. In addition, the fact that the average *unlevered* excess cost of equity does not drop in other years suggests a close connection between the changes in the *unlevered* excess cost of equity and carve-out transactions.

Table 3 further shows that financial analysts do not expect profitability of parent firms to improve following carve-outs. The mean values of forecasted profitability for current fiscal year and next fiscal year are both declining over time, with mean values of -0.92% and -0.43% respectively in year 0. Similarly, financial analysts do not change significantly their expectations to long-term growth rates in EPS around carve-outs (-0.38% in year 0), except in year -1. Finally, there is no systematic change in payout policies of parent firms over time. Although parent firms raise new funds from the equity offerings of their subsidiaries, they do not increase their payout ratios after the transactions.

Overall, Table 3 shows a significant reduction in the average cost of equity of parent firms in the carve-out year, after controlling for changes in financial leverage and risk-free rate. On the other hand, financial analysts do not expect operating performance of parent firms to improve after carve-outs, either in short-term or in the long run. The finding suggests reduction in the cost of equity is the major source of valuation creation in carve-out transactions.

Table 3. Summary statistics of yearly change in key variables from year -2 to year +2 relative to equity carve-outs

Variables include (1) cost of equity and *unlevered* excess cost of equity; (2) forecasted profitability for current and next fiscal years; (3) forecast long-term EPS growth rate taken from I/B/E/S; and (4) dividend payout ratio.

Data for analysts' EPS forecasts and stock prices are taken as of month -3 relative to the end of current fiscal year. Cost of equity is estimated using the residual income model, as introduced in Section 3. The result value is then (1) adjusted for financial leverage assuming Modigliani and Miller's world with corporate taxes and (2) subtracted by 3-month T-bill yield, to get unlevered excess cost of equity. Forecasted profitability is defined as the mean forecast on EPS divided by book value of common equity per share at previous fiscal year end.

Dividend payout ratio is defined as common dividends (#21) divided by the excess of income before extraordinary items (#18) over preferred dividends (#19). Dividend payout ratio is restricted to be between zero and one. Payout ratios higher than one will be assumed to be one and loss-making firms are assumed to have payout ratios equal to zero.

Year 0 is the fiscal year ended between month -9 to month +2 relative to the equity carve-out filing month. Year 1 is the fiscal year ended between month 0 and month +11 of equity issue of carve-out unit. *t*-statistics are reported in parentheses in *, ** and *** represent significant levels at 10%, 5% and 1% respectively.

Year	-2	-1	0	+1	+2
(1) Δ Cost of equity (%)					
Mean	-0.46**	-0.22	-1.03***	0.21	-0.44*
N	112	118	142	122	107
(2) Δ Unlevered excess cost of equity (%)					
Mean	-0.21	0.24	-0.64***	-0.03	-0.23
N	112	118	142	119	103
(3) Δ Forecasted profitability for current fiscal year (%)					
Mean	-3.19*	-1.73**	-0.92	-2.38**	-0.57
N	114	120	142	122	107
(4) Δ Forecasted profitability for next fiscal year (%)					
Mean	-2.72**	-2.37**	-0.43	-1.35	-0.27
N	114	120	142	122	107
(5) Δ Forecast long-term EPS growth rate (%)					
Mean	-0.24	-0.66*	-0.38	-0.17	-0.16
N	114	120	141	122	106
(6) Δ Dividend payout ratio (%)					
Mean	4.55	0.96	-1.28	-4.39	0.35
N	114	120	142	122	107

5.2 The effect of forecasted profitability on the cost of equity

As implied by the residual income model, the estimated cost of equity will mechanically decrease if forecasted profitability drops, keeping other variables constant. It is possible that the decline in the *unlevered* excess cost of equity is driven by a drop in forecasted profitability. Table 4 reports the test for the impact of changes in forecasted profitability and other variables on the cost of equity.

Panel A reports the summary statistics for the estimated cost of equity and its underlying parameters in year -1. The median cost of equity is 9.99%. Given a median 3-month T-bill rate of 5.30% for the sample, a 9.99% cost of equity implies an equity premium of about 4.70% which is comparable to equity premiums documented in previous studies.⁶

⁶ The equity premium estimates commonly cited in early literature come from Ibbotson Associates' annual reviews of the performance of the U.S. stocks and bonds since 1926. Those estimates lie in the region of 7 to 9 percent per year.

The median values of forecasted profitability for current and next fiscal years are 12.70% and 15.21% respectively, suggesting parent firms are expected to have profitability similar to the historical profitability of other firms in the same industry (median industry target profitability of 13.95%). Finally, a median parent firm is traded at 2.11 times its book value.

Panel B repeats the same summary statistics for changes in the cost of equity and its underlying parameters from year -1 to year 0 as those in Table 3.

Using residual income models to estimate cost of equity, Claus and Thomas (2001), Gebhardt, Lee and Swaminathan (2001) and Gode and Mohanram (2003) obtain equity premiums between 2% to 4% for 1980's and 1990's. Fama and French (2002) estimate equity premium using dividend and earnings growth rates and obtain an estimate of 3.54% for 1872 to 2000. This paper finds an average equity premium of 4.70% for the sample parent firms in carve-outs. However, unlike those mentioned studies, the yield of 3-month T-bill rate is used as the risk-free rate to calculate equity premium. If 10-year T-note yield is used, an average value 2.2% of equity premium is obtained.

Panel C reports the sensitivity analysis for the change in the cost of equity. The cost of equity for the base case is 9.79%, estimated based on the median values of the parameters reported in Panel A. The second row of Panel C reports a 0.12% decline in the cost of equity if the values of forecasted profitability for current and next fiscal years are adjusted by their mean changes (i.e. -0.92% and -0.43%), with the values of other parameters remaining unchanged. This suggests that the decline in forecasted profitability explains only a small change in the cost of equity in the carve-out year. In the third and fourth rows of Panel C, forecast long-term growth and industry target profitability are adjusted by their mean changes (i.e. -0.38% and -0.10%) separately but the adjustments of those variables also have minor effect on the cost of equity. In the fifth row, all three sets of variables are adjusted together but the effect on the cost of equity is still minor. In sum, Table 4 suggests that although all measures of forecasted profitability drop in carve-out year, they explain less than one-fifth of the overall reduction in the cost of equity.

Another concern of using residual income model to estimate the cost of equity is stale forecasts. If

stock market reacts positively to the news about carve-outs but financial analysts fail to incorporate the information into their forecasts, there will a mechanical decline in the cost of equity. However, Table 4 shows that financial analysts show substantial forecast revisions in the carve-out years. The standard deviation of change in forecasted profitability for current year is 8.73%, compared to 2.52% of standard deviation of change in the cost of equity. A further analysis (not reported) shows that an 8.73% increase in forecasted profitability could translate into a 2.24% increase in the cost of equity, suggesting stale analysts' forecasts unlikely cause the reduction in the cost of equity.

In sum, Table 4 finds that the mean change in the cost of equity of parent firms around carve-outs is large compared to the mean changes in other variables that have mechanical impact on the cost of equity. In addition, large variations for the changes in forecasted profitability show that financial analysts do frequently revise their forecasts. Both findings suggest that the decline in the cost of equity around carve-outs is not mechanical.

Table 4. Effect of change in forecasted profitability on the cost of equity estimate

Panel A reports the level of cost of equity and its underlying parameters in year -1 of equity carve-out. Parameters include forecasted profitability, long-term growth forecast, industry target profitability, dividend payout ratio, as defined in Table 3. Price-to-book ratio is defined as price per share divided by book value of equity per share in previous fiscal year. Panel B reports summary statistics for the changes in levels from year -1 to year 0. Panel C presents the sensitivity analysis of the cost of equity estimate to underlying parameters, assuming the levels of those parameters changed by the mean values reported in Panel B.

Panel A: Levels in year -1	Mean	Median	Std. Dev.	N
Cost of equity (%)	10.34	9.99	3.56	142
Forecasted profitability for current year (%)	15.17	12.70	14.21	142
Forecasted profitability for next year (%)	16.61	15.21	10.33	142
Long-term growth forecast (%)	15.13	13.54	6.65	141
Industry target profitability (%)	13.96	13.95	2.00	142
Dividend payout ratio (%)	35.23	28.21	35.09	142
Price-to-book ratio	2.58	2.11	2.11	142
Panel B: Change in levels from year -1 to year 0				
ΔCost of equity (%)	-1.03	-0.83	2.52	142
ΔForecasted profitability for current year (%)	-0.92	-0.15	8.73	142
ΔForecasted profitability for next year (%)	-0.43	-0.16	6.73	142
ΔLong-term growth forecast (%)	-0.38	-0.35	3.70	141
ΔIndustry target profitability (%)	-0.10	-0.03	0.42	142
ΔDividend payout ratio (%)	-1.28	0.00	33.43	142
ΔPrice-to-book ratio	0.29	0.21	2.04	142
Panel C: Sensitivity analysis for cost of equity estimate (assuming the parameters changed by the mean values reported in Panel B)				
	Cost of equity (%)	Change from the base case (%)		
(1) Level for base case	9.79	-		
(2) Forecasted profitability for current year and next year	9.67	-0.12		
(3) Long-term growth forecast	9.77	-0.02		
(4) Industry target profitability	9.73	-0.06		
(5) Forecasted profitability, long-term growth forecast and industry target profitability	9.61	-0.18		

5.3 Estimation risk and change in cost of equity

Table 5 reports univariate tests for the effect of estimation risk on the *unlevered* excess cost of equity. Equity carve-outs are partitioned into groups based on their differences in estimation risk suggested in Section 3. Panel A divides the sample by the number of business segments operated by the parent firms before carve-outs. Parent firms are divided into (1) those with 4 or more segments and (2) those with fewer than 4 segments. The result shows that the reduction in the *unlevered* excess cost of equity is stronger for the former group than for the latter (the difference is significant at the 10% level). This evidence is consistent with Vijh's (1999) argument that the disclosure effect of equity carve-outs is stronger for more complex firms than for less complex ones.

Panel B divides the sample by the stated motivations of equity carve-outs. If the value creation comes mainly from unlocking hidden value, parent firms who state creating pure-plays as the major reason for carve-outs will experience larger reductions in the *unlevered* excess cost of equity. Consistent with the prediction, carve-outs motivated by creating pure-plays result in larger reduction in the *unlevered* excess cost of equity for parent firms than other carve-out transactions. On the other hand, there is no significant difference when the sample carve-outs are divided based on "Restructuring"/"Non-restructuring" reasons. The result reconfirms that equity carve-outs create value mainly through a reduction in the cost of equity, not an improvement in operating performance.

Panel C divides the sample by change in analyst coverage from year -1 and year +1. "Increase" group includes 94 carve-outs after which the parents get

more analyst coverage and "Reduction/Unchanged" group includes the other 48 carve-outs. The result shows that parent firms which have more analyst coverage have a significant reduction in *unlevered* excess cost of equity, while those receive lower coverage do not have a significant reduction. The result suggests that more analyst coverage helps reduce estimation risk.

5.4 Announcement stock returns and change in cost of equity

Previous studies show that parent firms react positively to the carve-out announcements on average. If reduction in the cost of equity is the major source of value in carve-outs and stock market is efficient, the cumulative abnormal returns (CARs) of parent firms should be negatively related to expected change in the cost of equity. The CARs of a parent firm is measured over a 5-day event window [-2, +2] around the carve-out announcement. Model parameters are estimated by market model using stock return data over a window from 150 trading days to 51 trading days before the announcement date.

Panel D of Table 5 divides parent firms by their CARs around carve-out announcements. "Positive" group consists of 86 firms which stocks react positively to the announcements while "Zero/Negative" group contains the rest. Parent firms in "Positive" group on average experience a significant 0.90% decline in the *unlevered* excess cost of equity while other parent firms do not. The result suggests that the positive market reaction is partly driven by an expected reduction in the cost of equity. An additional analysis (not reported) shows that the CARs are not significantly related to change in forecasted profitability.

Table 5. Partition analysis on yearly [-1, 0] change in *unlevered* excess cost of equity

Unlevered excess cost of equity of parents are estimated by a residual income model and adjusted for financial leverage and 3-month T-bill yield, described in Section 3.

Panel A divides the sample by the number of business segments operated by a parent firm before carve-outs, where the number of segments is obtained from Compustat Business Information File. "4 segments or above" group contains parent firms that operate at least four business segments before equity carve-outs.

Panel B divides the sample by stated motivations of carve-outs. "Pure-play" group contains carve-outs that are motivated by reasons (2a) – (2d) in Table 2 and "Restructuring" group contains carve-outs that are motivated by reasons (1a) – (1c) in Table 2.

Panel C divides the sample by the change in analyst coverage from the year before carve-out to the year after carve-out. "Increase" group contains parent firms that gain more analyst coverage after the transactions. Change in analyst coverage is defined as the number of analysts following the parent and the carve-out unit in year 1 minus the number of analysts following in year -1. If analyst coverage in year 1 is not available, the value in year 0 is taken.

Panel D divides the sample by cumulative abnormal returns (CARs) around carve-out announcement. The CARs of a parent firm is measured over a 5-day event window [-2, +2] around the carve-out announcement. Model parameters are estimated by market model using stock return data over a window from 150 trading days to 51 trading days before the announcement date. "Positive" group contains parent firms that earn positive CARs around the announcements.

t-statistics for the difference in mean values between groups is reported based on the unequal variances assumption between groups. *, ** and *** represent significant levels at 10%, 5% and 1% respectively.

	Mean	N
Panel A: Classified by number of segments operated		
(1) 4 segments or above	-0.99% ^{***}	60
(2) Less than 4 segments	-0.38% [*]	82
(1) – (2)	-0.62% [*]	142
Panel B: Classified by motivations of equity carve-outs		
(1a) Pure-play	-1.32% ^{***}	31
(2a) Non-pure-play	-0.45% ^{**}	111
(1a) – (2a)	-0.87% ^{**}	142
(1b) Restructuring	-0.75% ^{**}	48
(2b) Non-restructuring	-0.58% ^{***}	94
(1b) – (2b)	-0.17%	142
Panel C: Classified by change in analyst coverage		
(1) Increase	-0.83% ^{***}	94
(2) Reduction/Unchanged	-0.26%	48
(1) – (2)	-0.58%	142
Panel D: Classified by announcement CARs		
(1) Positive	-0.90% ^{***}	86
(2) Zero/Negative	-0.23%	56
(1) – (2)	-0.67% [*]	142

Overall, Tables 5 reconfirms that reduction in the cost of equity is the major source of value in carve-out transactions. In addition, the results support disclosure hypothesis of the cost of equity. Specifically, the reduction in the cost of equity is larger for parent firms with more business segments and whose transactions are motivated by creating pure-plays or resolving firm complexity. In addition, more analyst coverage also leads to larger reduction in the cost of equity, consistent with the informational role of financial analysts in collecting, processing and disseminating information.

6. Correlations

Table 6 reports the correlation coefficients of the variables for our regression analysis. Change in the cost of equity (levered) is also included for the purpose of comparison, although it is not used in regression analysis. Pair-wise correlations between variables are generally moderate ($\rho \leq 0.3$), except the correlations between change in the cost of equity and other variables. Therefore, multicollinearity is

unlikely to be a problem in the regression analysis below.

The bottom row of Table 6 shows a positive and significant relation between change in the cost of equity and change in leverage ($\rho = 0.35$). However, after purging the effect of financial leverage on the cost of equity, change in the *unlevered* excess cost of equity becomes unrelated to change in financial leverage ($\rho = 0.06$).

Change in the *unlevered* excess cost of equity is negatively related to change in analyst coverage ($\rho = -0.30$) and announcement CARs ($\rho = -0.21$), consistent with Table 5. Although previous partition analysis shows an insignificant relation between change in the *unlevered* excess cost of equity and change in forecast dispersion, the two variables are positively correlated in correlation analysis ($\rho = 0.21$). The result is consistent with the disclosure hypothesis that investors demand a low required return in a better information disclosure environment. Change in forecast dispersion also decreases with change in analyst coverage ($\rho = -0.23$).

Table 6. Correlations among key variables for regression analysis

Variables include (1) change in cost of equity / *unlevered* excess cost of equity; (2) change in forecast dispersion; (3) change in forecasted profitability; (4) change in book debt-to-market capitalization; (5) change in number of analysts following; (6) announcement CAR. *, ** and *** represent significant levels at 10%, 5% and 1% respectively.

		ΔU_COST	ΔSTD_FE	$\Delta FROE$	$\Delta LEVER$	$\Delta ANALY$	$CAR[-2,+2]$	$\Delta EQCOST$
$\Delta Unlevered$ excess cost of equity	ΔU_COST	1.00						
$\Delta Forecast$ dispersion	ΔSTD_FE	0.21**	1.00					
$\Delta Forecasted$ profitability	$\Delta FROE$	-0.12	-0.17**	1.00				
$\Delta Financial$ leverage	$\Delta LEVER$	0.06	0.31***	-0.12	1.00			
$\Delta Analyst$ coverage	$\Delta ANALY$	-0.30***	-0.23***	0.17**	-0.06	1.00		
Announcement CAR	$CAR[-2,+2]$	-0.21**	-0.09	-0.06	-0.00	0.13	1.00	
$\Delta Cost$ of Equity	$\Delta EQCOST$	0.74***	0.34***	-0.08	0.35***	-0.32***	-0.22***	1.00

7. Multivariate Analysis for Change in Unlevered Excess Cost of Equity

Table 7 reports the OLS estimates of change in the *unlevered* excess cost of equity. The expected signs are indicated beside the variables. For each regression, a set of year dummies are added to control for cross-correlations of stock price movements.

Independent variables in Column 1 include forecasted profitability, change in forecast dispersion, change in analyst coverage and change in financial leverage. The results show that an increase in analyst coverage leads to decline in the *unlevered* excess cost of equity. Change in forecast dispersion is unrelated to change in the cost of equity.

Column 2 reports the regression result with only dummy variables for three motivations as independent variables. Parent firms of carve-outs motivated by creating pure-plays exhibit larger declines in the cost of equity than other firms. On the other hand, restructuring or incentive reasons do not have significant effect on the cost of equity. The result is consistent with Vijh (2002) that creating pure-plays is a major motivation for carve-outs. It is also consistent with the stated reasons by corporate managers that carve-outs can unlock hidden values of the parent firms by creating a public market for the carved-out units.

Column 3 includes all the independent variables used in Columns 1 and 2. Only change in analyst coverage is still significant in the regression. On the other hand, the dummy variable for pure-play reasons becomes insignificant. It is possible that the effects of change in analyst coverage and pure-play reasons on the *unlevered* excess cost of equity are highly correlated. Therefore, Column 4 excludes change in analyst coverage from the regression model in Column 3. As predicted, the coefficient of pure-play reasons becomes negative and significant again.

Column 5 keeps change in forecasted profitability, change in forecast dispersion and change in analyst coverage in the regression model as independent variables. In addition, two dummy variables are included to capture the effect of the use

of proceeds to repay debt and complexity of parent firms before equity carve-outs. The announcement CARs and change in industry excess cost of equity are included as additional control variables. Industry excess cost of equity is the average *unlevered* excess cost of equity of all firms (excluding the sample firm) with the same 2-digit SIC code as that of the sample firm.

A dummy variable for hot (high-volume) issue periods is also included to control for activity in primary equity market. Previous studies find that more firms issue equity when investors are willing to pay higher prices for their shares. Since equity carve-outs are special forms of equity offerings, it is possible that managers do carve-outs when investors overvalue the subsidiaries. Following Bayless and Chaplinsky (1996), monthly aggregate equity issue volume from Federal Reserve Bulletin between 1981 and 2000 is scaled by end-of-month aggregate value of outstanding equity from CRSP. Three-month moving average of equity volume is ranked into quartiles. High volume issue periods are at least three contiguous months where equity volume exceeds the upper quartile.

Consistent with Vijh (1999), parents operating more than four segments experience a larger reduction in the *unlevered* excess cost of equity than other less complex firms, suggesting more complex firms get greater benefits by improving investors' understanding to individual businesses. However, the use of proceeds to repay debt cannot explain the reduction in the *unlevered* excess cost of equity, inconsistent with Allen and McConnell (1998).

Industry-wide and market-wide factors also partly explain the change in cost of equity around carve-outs. The coefficient of change in industry excess cost of equity is positive, suggesting the existence of a common factor driving the cost of equity of firms in the same industry. The coefficient of the dummy variable for hot issue periods is negative, consistent with previous studies that investors are more optimistic in hot issue periods and therefore require lower returns on their investments than in cold periods.

Finally, two additional dummy variables are included to indicate post-carve-out events in Column 6. The first one indicates one of the disposal events announced by parent firms: spin-offs, sell-offs or public offerings. The other one indicates the cases in which parent firms announce to reacquire the carved-out units. As predicted, the reduction in the *unlevered* excess cost of equity is higher for parent firms which

completely dispose the carved-out units. The result is consistent with the hypothesis that complete disposal of the carved-out unit makes the operations of parent firm more transparent and therefore reduces the estimation risk of investors. On the other hand, re-acquisitions of the carved-out units have no significant effect on the cost of equity.

Table 7. Cross-sectional regressions of change in *unlevered* excess cost of equity around equity carve-outs

Independent variables include (1) change in forecasted profitability; (2) change in forecast dispersion; (3) change in analyst coverage; (4) change in leverage; (5) dummies for restructuring, pureplay and incentive reasons of carve-outs; (6) dummy for parent or carve-out unit which uses proceeds to repay existing debt; (7) dummy for parents with more than 4 business segments before equity carve-outs; (8) 5-day [-2,+2] CARs of parent's stock around announcement day; (9) change in industry *unlevered* excess cost of equity (10); a dummy variable for hot issue period, defined in the same way as Bayless and Chaplinsky (1996); (11) two dummy variable for subsequent events; and (12) a set of year dummies (not reported). Robust *t*-statistics are reported in parentheses. *, ** and *** represent significant levels at 10%, 5% and 1% respectively.

	[1]	[2]	[3]	[4]	[5]	[6]
Δ Forecasted profitability (-)	-0.002 (-0.06)		-0.008 (-0.30)	-0.015 (-0.51)	0.005 (0.20)	-0.001 (-0.03)
Δ Forecast dispersion (+)	0.183 (1.08)		0.183 (1.07)	0.255 (1.23)	0.039 (0.28)	-0.009 (-0.06)
Δ Analyst coverage (-)	-0.001*** (-3.06)		-0.001*** (-2.91)		-0.001*** (-3.09)	-0.001*** (-3.17)
Δ Financial leverage (+/-)	-0.000 (-0.29)		-0.000 (-0.40)	-0.000 (-0.28)		
Dummy for restructuring reasons (+/-)		0.002 (0.41)	0.004 (1.19)	0.003 (0.80)		
Dummy for pureplay reasons (-)		-0.007** (-2.15)	-0.005 (-1.51)	-0.007** (-2.04)		
Dummy for incentive reasons (+/-)		-0.002 (-0.40)	-0.004 (-1.08)	-0.003 (-0.56)		
Dummy for using proceeds to repay debt (+/-)					-0.002 (-0.88)	-0.001 (-0.35)
Dummy for parents with more than 4 segments (-)					-0.008*** (-2.60)	-0.010** (-2.97)
Cum. abnormal returns on carve-out news [-2 to +2] (-)					-0.042** (-2.52)	-0.047*** (-2.96)
Δ Industry <i>unlevered</i> excess cost of equity (+)					0.649*** (6.72)	0.610*** (6.33)
Dummy for hot issue period (-)					-0.007** (-2.00)	-0.006* (-1.76)
Dummy for subsequent spin-off, sell-off or public offering of carve-out unit (-)						-0.007** (-2.52)
Dummy for parent firm reacquiring the carved-out unit (+)						0.001 (0.15)
Intercept	-0.004*** (-2.62)	-0.005** (-2.26)	-0.004* (-1.83)	-0.006** (-2.50)	0.006** (2.17)	0.009*** (2.94)
N	142	142	142	142	142	142
Adj. R-sq	36.6%	28.9%	37.0%	30.7%	54.0%	55.8%

8. Conclusion

I examine the impact of equity carve-outs on the cost of equity of parent firms. The results show that the average cost of equity of parent firms reduces significantly around the time of equity carve-outs, after controlling for changes in financial leverage and risk-free rate. Consistent with estimation risk hypothesis, more complex parent firms and parent firms with higher increases in analyst coverage show larger reductions in cost of equity than other parent firms. In addition, the reduction in the cost of equity is higher when a carve-out is motivated by creating a pure-play. Finally, the reduction in the cost of equity is related to the subsequent disposal event, consistent with the prediction that a complete disposal of the carved-out unit further improves corporate transparency.

The major contribution of this paper is to show that it is reduction in the cost of equity, rather than improvement of future earnings, that creates value in carve-out transactions. While there have been many previous studies showing that equity carve-outs create value for the parent firms, this paper is the first one which directly examines the effects of equity carve-outs on the cost of equity of parent firms.

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