



Stock price and systematic risk effects of discontinuation of corporate R&D programs

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ABSTRACT

We extend the evidence on whether investors impound efficiently into stock prices new disclosures about corporate R&D programs. We find that firms that disclose the discontinuation of some of their R&D programs experience a significant negative announcement-period stock price response which is worse for growth stocks, for small-size firms, and for firms with low operating cash flow. We find no evidence that R&D discontinuing firms experience an event-induced change in their systematic risk. We find evidence of a one-year-long price reversal; however, it is not robust to controlling for possible risk dimensions for firms with R&D capital that the three-factor model does not capture. Evidently, investors' initial response at disclosures of discontinuation of corporate R&D programs is efficient.

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Research and development (R&D) investment creates new strategic options for a firm (Bowman and Hurry, 1993; Dixit and Pindyck, 1995), and it is widely recognized as a major source of competitive advantage (Schumpeter, 1934; Ansoff, 1965). However, there is some controversy as to whether investors in U.S. capital markets value R&D efficiently. On one hand, some scholars argue that investors focus excessively on the short-term performance of the firm and do not appreciate long-term strategic investments such as R&D (e.g., Drucker, 1986; Stein, 1988; Porter, 1992; and Hall, 1993). Therefore, R&D-intensive firms must be under-valued, following that argument, and the cost of financing R&D is too high, which leads to sub-optimal investment. On the other hand, Jensen (1993) contends that many corporate R&D investments are in fact not profitable and investors systematically overlook this possibility, which implies that the valuation of some R&D-intensive stocks is excessively high, and therefore the cost of financing R&D is often times too low, which leads to over-investment.

The evidence from the short-term event-studies of Chan et al. (1990) and Szcwczyk et al. (1996) indicates that investors generally react positively to (i.e., value) announcements of corporate plans to increase R&D expenditures, and they rationally differentiate between value-creating and value-wasting R&D. Additionally, Chan et al. (2001) find that firms with R&D capital show no long-term excess returns,² which suggests that the stock price of these firms incorporates fully the benefits of R&D spending (i.e. investors' expectations are unbiased). However, Eberhart et al. (2004) report that firms which increase their R&D expenditures experience significant positive abnormal stock returns during the five-year period following the increase, and therefore, investors initially under-value R&D investment. Making the evidence even more mixed, Chambers et al. (2002) report

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² Chan et al. (2001) find that firms with any level of R&D intensity (i.e. high, medium or low R&D expenditure-to-sales ratio) show no significant excess returns (based on control portfolios of stocks matched by firm size and book-to-market ratio, or firm size and book equity plus the value of R&D capital divided by market equity) over the three post-formation years of the portfolio (see Table 3 and footnote 16). Interestingly, Lev and Sougiannis (1999) provide evidence that the R&D capital to market value ratio of a firm appears to capture an important risk dimension for R&D intensive firms.

results which suggest that a positive association between R&D investment levels and excess returns is more likely the result of failure to control adequately for risk than of mispricing.

Since the evidence is mixed as to whether investors in U.S. capital markets value R&D efficiently, and therefore finance it at an appropriate cost of capital, and given the important macro-economic policy implications of that question, we extend the empirical evidence by examining whether investors impound efficiently into stock prices disclosures of discontinuation or abandonment of corporate R&D programs. Under the semi-strong form of the “Efficient Capital Markets’ Hypothesis”, the disclosure of relevant new corporate information should result in immediate and unbiased revisions in investors’ expectations, i.e., a significant short-term stock price reaction without any significant post-event long-term abnormal price drift.

It is important and interesting to examine disclosures of discontinuation or abandonment of corporate R&D programs for several reasons. First, based on the magnitude of the stock price response to this type of event, the discontinuation of a failed or failing corporate R&D program is evidently a more significant development or news to investors than periodical (perhaps predictable) increments in R&D spending. Accordingly, analysts and investors’ following may be heightened at that juncture, which provides an opportunity to examine whether the price correction is efficient. Second, announcements of discontinuation or abandonment of corporate R&D programs are specific, not-confounded, and unambiguous disclosures about (the abandonment of) some of the firm’s real growth options; unlike the case of announcements of increases in corporate-wide R&D budgets.³ Third, it has not been examined in the Finance literature, and we cannot simply extrapolate the findings from other types of corporate divestment, such as capital expenditure reductions, to this event since the attributes of corporate R&D capital are different from those for capital assets.⁴

Our sample of discontinuation or abandonment of corporate R&D programs consists of 218 non-contaminated announcements made in the period from April 1982 through November 2004 by NYSE, Amex and NASDAQ traded firms with sufficient data on CRSP. The sample firms are predominantly low book-to-market ratio firms and they invest in R&D intensively. They have a noticeably high R&D-to-market-value ratio, perhaps due to the significant risk(s) of their R&D capital. They tend to have a low debt-to-market-value ratio, which is optimal for firms with mostly intangible/specific assets. In about 38% (versus 57%) of the sample cases, the announcing firm appears (does not appear) to have cash flow problems as its ratio of earnings before interest, taxes and depreciation to total assets suggests. Therefore, there may be sub-sample differences in the motivation for the corporate R&D program discontinuation (i.e., the desperate need to reduce cash payments versus efficiency reasons). Finally, the sample firms did not prior to event change their R&D intensity compared to three or five years earlier.

We find that the sample firms experience significant negative two-day announcement-period abnormal stock returns on the magnitude of -4.42% . This negative investor response is significantly worse for lower—compared to higher book-to-market ratio firms, for smaller—compared to larger-size firms, for firms with low compared to high operating cash flows, but equally bad during bear and bull stock markets. These results indicate that: 1) shareholders of these firms are typically disappointed to learn that these R&D programs turned out to be unsuccessful; 2) the bad news are worse for investors at firms whose growth opportunities constitute a more significant portion of their market value; 3) the bad news are worse for investors at firms with fewer R&D programs/growth opportunities; 4) the bad news are worse when the abandonment decision may be due to cash-flow-constraints; and 5) the general condition (or mood) of the stock market does not affect (or bias) the R&D event-induced revisions in investors’ expectations.

Next, we examine whether the discontinuation of corporate R&D programs changes the systematic risk of the event-firms. Two reasons motivate this examination. First, with assets-in-place unchanged, the abandonment of growth options may change the firm’s overall systematic risk since several theoretical models (e.g., [Gomes et al., 2003](#); [Zhang, 2005](#)) propose that growth options and assets-in-place have different systematic risk. Second, an increase (a decrease) in the event-firms’ systematic risk may qualify any later found post-event long-term positive (negative) abnormal return. We estimate the changes in the factor-loadings of the [Fama and French \(1993\)](#) three-risk-factor model over one-, two- and three-years following the R&D discontinuation. Then, we estimate the R&D-discontinuation-induced change in the cost of equity by multiplying each of the changes in the risk-factor-loadings by the mean monthly realization of the corresponding risk factor over the sampling period and then summing up the three products. We find that none of the estimated changes in the event-firms’ cost of equity is statistically significant at conventional levels.

We examine the long-term stock price performance of the sample firms over the first, second and third post-announcement years to determine whether investors’ initial response is efficient.⁵ We use the Fama–French three-factor model for equally- and value-weighted event-portfolio returns and the ordinary- and weighted-least-squares (OLS and WLS) estimation methods, and we apply the bootstrapping procedure prescribed by [Mitchell and Stafford \(2000\)](#). We find statistically significant positive abnormal stock returns over only the first year following the disclosure of discontinuation of corporate R&D programs. This apparently robust

³ These latter typically do not include information about what part of the R&D budget increase will fund new R&D programs that create new real growth options, what part is budgeted to exercise existing real growth options, and what part is to pay for unexpected cost over-runs at already existing programs. Also, they are typically made concurrently with announcements pertaining to end-of-fiscal period financial results, etc. (see [Chan et al., 1990](#); and [Szewczyk et al., 1996](#)).

⁴ Difficulties with exclusively appropriating the rent of the R&D investment ([Polanyi, 1962](#); [Nelson and Winter, 1982](#); [Bhide, 2000](#); [Zingales, 2000](#); [Spence, 1984](#); [Jaffe, 1986](#)), the high uncertainty pertaining to its output, and the high information asymmetry between the scientists and the investors, all these attributes of R&D differentiate it from capital investment.

⁵ We examine the abnormal return in each post-event year separately because [Fama \(1998\)](#) points out correctly that an initial abnormal return can grow with the investment horizon even if there is no abnormal return after the initial period.

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