THE INFLUENCE OF MANAGERIAL ATTRIBUTION ON CORPORATE ENTREPRENEURSHIP

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ABSTRACT

In this paper, we explore the role of managerial attribution on changes in CE. Specifically, we look at how a manager attributes past performance and how it impacts subsequent CE behavior. Previous research into the link between performance and entrepreneurial activities such as R&D spending has tended to assume a linear and positive relationship (Hall, 1992; Himmelberg, & Petersen, 1991; Bougheas, Görg & Strobl, 2003), especially in high tech firms. However, R&D spending has also been shown to fluctuate over time and sometimes without regard to previous performance (Cuervo-Cazurra & Un, 2010; Filatotchev & Piesse, 2009; Levesque et al., 2012). We argue that how managers attribute past performance will affect their future investments into CE activities. More specifically, the extent to which managers attribute performance to the firm itself have differential investments in CE than those who attribute performance to competitive pressures or environmental uncertainties.

INTRODUCTION

Previous research has sought to understand how and to what firms, managers or employees attribute an outcome (Green & Mitchell, 1979; Harvey et al., 2006). In particular, several studies have tried to explain the link between managerial attribution and performance (Bettman & Weitz, 1983; Salancik & Meindl, 1984; Clapham & Schwenk, 1991), and financial policies or forecasts (Li, 2010; Libby & Rennekamp, 2012). Attribution theory has also been used to see how attribution style affects new venture formation (Parker, 2009; Tang, Tang, & Lohrke, 2008), entrepreneurial success (Diochon, et al., 2007) and entrepreneurial exit (Ucbasaran et al., 2010). It has been suggested that entrepreneurs are more likely to attribute favorable outcomes to their own actions and unfavorable ones to factors beyond their control (Baron, 1998). However, we have limited knowledge about the role of managerial attribution in the persistence of corporate entrepreneurship behaviors.

Corporate entrepreneurship (CE) is the means by which organizations grow and attain positive performance outcomes (Zahra & Covin, 1995; Kuratko, 2007). Research has tried to understand the triggers or antecedents to CE, including managerial support (Kuratko et al., 1993), organizational structures (Burns & Stalker, 1961), culture (Kanter, 1985; Chandler, et al., 2000), and incentive systems (Sathe, 1989; Balkin & Gomez-Mejia, 1987). Ireland et al. (2009) suggest that entrepreneurial cognition of organizational members is an important antecedent to corporate entrepreneurship strategy. However, research has also shown that CE fluctuates over time (Wales et al., 2011). But we have limited understanding for why these fluctuations might take place.

In this paper, we explore the role of managerial attribution on changes in CE. Specifically, we look at how a manager attributes past performance and how it impacts subsequent CE behaviors. This is important as previous research into the link between performance and entrepreneurial
activities such as R&D spending has tended to assume a linear and positive relationship (Hall, 1992; Himmelberg & Petersen, 1994; Bouheas, Görg & Strobl, 2003), especially in high tech firms. However, R&D spending has also been shown to fluctuate over time and sometimes without regard to previous performance (Cuervo-Cazurra & Un, 2010; Filatotchev & Piesse, 2009; Levesque et al., 2012). We argue and empirically show that how managers attribute past performance will affect their future investments into CE activities. More specifically, the extent to which managers attribute performance to the firm itself have differential investments in CE than those who attribute performance to competitive pressures or environmental uncertainties.

THEORETICAL DEVELOPMENT AND HYPOTHESES

Managerial Attribution and Corporate Entrepreneurship

A large body of literature centers on the manager’s or entrepreneur’s attributional bias — the tendency to attribute positive events to oneself and negative events to external factors (Billett & Qian, 2008; Libby and Rennekamp, 2012). Much of this literature focuses on how such bias leads to erroneous decision-making on part of the top management, poor firm outcomes or fluctuations in market reactions. Li (2010) finds that managers’ self-serving attribution bias (as reflected by their extent of self-referencing in Management Discussion & Analysis in 10-Ks) is positively related to negative market reactions to new acquisitions and over-reliance on leverage and debt-financing. Other studies show that managerial attribution-bias is linked to more frequent acquisitions and over-investment (Doukas & Petmezas, 2007; Billett & Qian, 2008).

However, attribution style can also be used to explain a range of entrepreneurial behavior, both in new ventures and established firms. Such application is seen in Gatewood et. al’s (1995) work which shows that entrepreneurial persistence in setting up a business is significantly influenced by attribution. Other dimensions of entrepreneurial behavior have also been explored using attribution theory. For instance, Tang, Tang & Lohrke (2008) find that risk-taking propensity is significantly higher for nascent entrepreneurs with high internal attributional styles. Barker & Barr (2002) show that top management is more likely to undertake strategic reorientation when they attribute performance decline to internal causes. Mullins, Forlani & Walker (1999) suggest that internal attributions lead to greater new-product risk-taking by managers.

Firm Performance, Liquidity and Corporate Entrepreneurship

Studies looking at the effect of firm performance suggest both a positive and negative influence of prior performance on corporate entrepreneurship. Some suggest that a decline in performance is followed by attempts at turnarounds, which can take also take the form of higher R&D spending. For instance, Hundley et al (1996) find that when faced with decline in performance, Japanese firms increased their level of R&D intensity. However, they also found that the R&D investment by U.S. firms was directly linked to past performance. Filatotchev & Piesse (2009) show that R&D intensity is positively dependent on accumulated intangible assets and negatively related to debt. Within the pharmaceutical industry, Hinkler, Kotabe & Mudambi (2010) find that prior breakthrough innovations by firms increase the likelihood of future breakthrough innovations. This suggests that strong previous performance by firms elicit more entrepreneurial efforts in the future. Lant, Milliken & Batra (1992) and Barker & Barr (2002) introduce the influence of
attribute on the relationship between firm performance and corporate behavior. They examine the firm's attempts at strategic reorientation following poor performance and find that it is less likely in the presence of external attribution for firms, especially in a more turbulent industry.

The relationship between liquidity and R&D spending is less ambiguous. For instance, Hall (1992) finds a strong positive relationship between R&D investments and cash flows for a sample of U.S. manufacturing firms. Hao & Jaffe (1993) find that liquidity is significantly positive for R&D in small firms, but insignificant in large firms. Nonetheless, some find no relationship between liquidity and R&D. For instance, Bond, Harhoff & Van Reenen (1999) study the effect of liquidity on German and U.K. firms. They find that liquidity does not affect R&D investment by German firms in any way and only affects the decision to engage in R&D for U.K. firms. Given the stronger support for a positive link between liquidity and R&D, we make the following hypothesis:

**Hypothesis 1:** Liquidity is positively associated with future R&D spending. Future R&D spending is higher at higher levels of liquidity than at lower levels.

We see that the direction of the relationship between performance/liquidity and future corporate entrepreneurship is not clear. However, as McGrath (2002) notes, attribution theory's focus on how people's interpretation of outcomes influences their propensity to persist with a course of action, makes the theory well-suited for explaining entrepreneurship. Thus, we proceed to explore how managerial attribution might further explain the links to corporate entrepreneurship. Figure 1 in Appendix represents our proposed model for liquidity, attribution and future R&D spending. Given the positive link between entrepreneurship and internal attribution, we posit that the relationship between liquidity and future R&D is moderated by attribution, particularly the relative levels of positive-internal attribution. Based on this, we make the following hypothesis:

**Hypothesis 2:** Internal-positive attribution is positively associated with future R&D spending. Future R&D spending is higher at higher levels of internal-positive attribution than at lower levels.

**Hypothesis 3:** Internal-positive attribution will moderate the relationship between liquidity and future R&D spending: Firm liquidity will be more strongly associated with high levels of future R&D spending when internal-positive attribution is high than when it is low.

The relationship between performance and R&D spending is viewed by many as direct and positive (Hall, 1992; Himmelberg, & Petersen, 1994; Bougheas, Görg & Strobl, 2003). However, others suggest that performance does not have a uniformly linear relationship with future R&D (Cuervo-Cazurra & Un, 2010; Filatotchev & Piesse, 2009; Levesque et al., 2012). We suggest that this may be due to the effect attribution has on entrepreneurial activities. Given that firm performance and attribution can influence R&D spending and since the firm's actual performance is likely to influence the kind of attribution that is made, we propose a mediating influence of attribution on R&D spending. Based on this, we make the following hypothesis:

**Hypothesis 4:** Internal-positive attribution will mediate the relationship between performance and future R&D spending.
METHODS

Context & Sample

Our data set consists of a random sample of 100 firms in the pharmaceutical industry. Focusing on one industry allows us to remove a lot of noise variance in a limited time period. We perform content analysis on the MD&A section of the 10-K filings to identify the type of attributions that are made by companies (Short et al., 2009). The use of MD&A section of firm reports allows for a relatively uniform method for coding attribution. Furthermore, MD&As are more closely linked to top management thinking, since the narrative provides an interpretation by the management of changes in firm performance (Li, 2010; Carton & Hofer, 2010). We code attribution based on the definition by Bettman and Weitz (1983): Attribution involves an instance of causal reasoning, where an attribute is linked to any performance outcome (sales, profits, income). We identify internal attribution factors (i.e., those related to the company) and several types of external attribution factors. We use publicly available data to capture changes in performance and R&D spending. R&D spending is a vital component of entrepreneurial activities in the pharmaceutical industry (Dunlap-Hinkler, et al., 2010) that relies on such spending to drive new product development. For each company, we use a lagged research model where we assess changes in performance on R&D spending in the subsequent year. That is, we see if an increase (or decrease) in performance leads to an increase or decrease in R&D spending over time, moderated by managerial attribution.

We coded the Management's Discussion and Analysis section of the Annual Reports of 100 randomly selected firms in the pharmaceutical preparations category (SIC:2384) for the year 2005. Firms in the industry are involved in the manufacturing, fabricating, or processing (www.osha.gov) of pharmaceutical drugs and are crucially dependent on research and development activities for their success. Coding for attribution requires a clear indication of cause and effect. Words and phrases such as because, as a result, resulting from, following, contributed to, led to, due to, impact of, accounting for, achieved with, resulted from, associated with, primary driver, represented, thereby, reflecting indicated causal reasoning. We considered positive and negative effects on sales, profit and income. We did not make an attributional coding when the direction of effect was unclear. That is, we needed a clear indication as to whether the external or internal factor improved or worsened (increased/decreased, strengthened/weakened) the outcome. Also, coding only pertained to attributions made for results in the current year (2005). Forward looking statements or discussion of performance in previous years was not considered. Since we undertook manual coding, attribution was assessed not just at the sentence level, but across paragraphs as well.

Attributions which related to firm-specific factors were coded as internal. Thus, internal attribution was made when performance was positively or negatively affected by firm-level decisions, specific products launched by the firm, product recall, a particular division of the firm, research or administrative expenses, operational efficiency, advertising, marketing etc. Attributions which related to factors not directly under the control of the firm were coded as external. Thus, external attribution was made when performance was positively or negatively affected by unforeseen circumstances or random fluctuations (a severe flu season, unprecedented publicity), regulation (FDA approval, new tax), macroeconomic factors (changes in interest rates, exchange rates), competition (introduction of generic products, market share loss to rival firms), legal issues (lawsuits, payments related to lawsuits), market (change in demand, changes
in consumer preferences), supplier (raw material costs, delivery of raw materials) and partner (joint ventures, collaboration agreements). Table 1 in Appendix provides a summary of the coding across internal-external and positive-negative categories.

**Measures**

The four basic measures of attribution are the total number of internal positive attributions (intp), external positive attributions (extp), internal negative attributions (intn) and external negative attributions (extn). Of these, we make use of intp in our mediation model. We develop several measures of relative attribution and use two of these to test both the models. We created the variable prelative (intp – extp) to measure the internality of the positive attributions of the firm. nrelative (intn – extn) is used to measure the internality of the negative attributions. Similarly, intrelative (intp – intn) measures the positivity of internal attributions and extrelative (extp – extn) measures the positivity of external attributions. The intrelative measure is one of the measures used to capture attribution in our models. Given that the number of attributions can be influenced by the size of the firm, we also consider the ratio between the different classifications of attribution (internal positive, internal negative, external positive, external negative) and total attribution. We use a second measure of attribution and this is the ratio between internal-positive and total attributions— intpratio.

We used COMPUSTAT to collect data on variables related to firm performance (sales), liquidity and firm size for 2004 & 2005. Research and development expenses are used to capture firm’s level of corporate entrepreneurship for 2005 & 2006. We want to see how attribution affects the relationship between a) changes in performance and future R&D and b) the relationship between changes in liquidity and future R&D. We define our measures in the following manner:

*Change in Future R&D* is our dependent variable. It is measured as the difference between R&D expenses in 2005 & 2006. The independent variable in our mediation model is *change in performance* and it is measured as the difference between firm sales in 2004 & 2005. The independent variable in our moderation model is *change in liquidity*. Liquidity for any given year is measured by subtracting current liabilities from current assets for that year. Change in liquidity measures the difference between 2004 & 2005. In model 1 we use *firm size* as a control variable and this is measured by total assets of the firm for 2005. Table 2 in Appendix provides the summary statistics for the independent and dependent variables and Table 3 provides the correlation matrix for these variables.

**RESULTS**

The following is our equation of interest for the relationship between R&D, liquidity and attribution:

\[
\Delta R&D_{t+1} = \alpha + \beta_1 \Delta Liquidity_{t+1} + \beta_2 Attribution_{t+1} + \beta_3 Attribution_{t+1} \times \Delta Liquidity_{t+1} + \beta_4 \text{Firm Size}_{t+1}
\]

We ran the OLS regression correcting standard errors for heteroscedasticity. For ease of interpreting the interaction effect, we center the components of the interaction term and the control variable. It suggests a significant relationship between the change in future R&D and
change in liquidity for both measures of attribution. First, we report the model with intpratio. The corresponding regression coefficient $\beta_1$ is both positive (0.29) and significant at the 1% level. Thus, hypothesis 1 is supported. Our moderating variable, attribution (99.07) is positive but insignificant ($p=0.18$) and therefore, hypothesis 2 is not supported. However, the interaction term (0.78) is both positive and significant at the 1% level, lending support to hypothesis 3. The control variable (.08) firm size is positive and significant at the 1% level. For the model with attribution measured as intrelative, all variables including the moderator are significant.

Figure 2 in Appendix shows how R&D spending varies for high and low attribution firms, at different levels of change in liquidity. R&D spending is clearly higher at higher levels of change in liquidity for both high and low attribution firms. But, for firms with large changes in liquidity, high attribution results in higher R&D spending, and for firms with small changes in liquidity, high attribution results in lower R&D spending.

It is possible that the relationship between liquidity and R&D spending is different across small and large firms. We run separate regressions to test the relationship for the smallest 50 firms and the largest 50 firms (by total assets) in the sample. Our regression reveals that while the interaction is still significant for the larger firms, none of the variables are significant for the smaller firms other than size (Figure 3 and Table 4 in Appendix). For large firms $\beta_1$ is both positive (0.32) and significant at the 1% level. Our moderating variable, attribution (96.04) is positive but insignificant (it is significant when measured as intrelative at the 10% level). However, the interaction term (0.79) is both positive and significant at the 1% level. The control variable, firm size (.08) is positive and significant at the 1% level. Nonetheless, the removal of the small firms, do not change the nature of interaction — firms with small changes in liquidity engage in more R&D spending at low levels of attribution and firms with large changes in liquidity do so at high levels of attribution.

The relationship between performance and R&D spending is viewed by many as direct and positive (Hall, 1992; Himmelberg, & Petersen, 1994; Bougheas, Görg & Strobl, 2003). However, others suggest that performance does not have a uniformly linear relationship with future R&D (Cuervo-Cazurra & Un, 2010; Filatotchev & Piesse, 2009; Levesque et al., 2012). We suggest that this may be due to the effect attribution has on entrepreneurial activities. Given that the firm’s actual performance is likely to influence the kind of attribution that is made, we propose a mediating influence of attribution on R&D spending.

We follow Baron & Kenny (1986) and conduct Sobel’s test to measure the mediation effect. We also performed bootstrapping to see if it improved upon the Sobel test results. The mediation model is not significant when we test the sample for either the intrelative or intpratio measure of attribution. However, the mediation model is significant when tested with the intp measure of attribution (Figure 5 in Appendix).

This second model meets Baron and Kenny’s requirements for mediation. First, change in firm performance (IV) is a significant predictor of change in future R&D spending (DV). Secondly, change in firm performance (IV) is a significant predictor of internal-positive attribution (MV). Finally, attribution (MV) is a significant predictor of the change in future R&D spending (DV), while controlling for change in firm performance (IV). Furthermore, the effect of change in firm performance (IV) decreases from .91 to .48 with the inclusion of internal-positive attribution (MV). Thus, we have partial support for the mediated relationship.
CONCLUSION

Our results have important implications for future research. First, our findings suggest a more refined and non-linear set of relationships between liquidity and R&D spending and performance and R&D spending than the literature has proposed. Second, our preliminary analyses reveal nine types of attributions: internal factors related to the company, and external factors such as its partners, suppliers, competition, market, regulations, legal issues, macroeconomic/political issues, and irregularities/fluctuations. This helps move the literature beyond overly simplistic internal versus external attribution. Third, we are able to identify the variations in the use of liquid assets between low attribution and high attribution firms; for firms with large changes in liquidity, high attribution results in higher R&D spending, and for firms with small changes in liquidity, high attribution results in lower R&D spending. This provides important insights that help to explain fluctuations in CE activities over time.

As such, our paper makes two significant contributions to the field of corporate entrepreneurship and managerial attribution. First, we find that attribution is a potential antecedent to CE activities over time. How and to what the firm attributes its past performance has an important impact on its future CE activities. Second, we extend understanding of the effects of managerial attribution into an area beyond performance, thereby allowing us to understand the linkage between attribution and entrepreneurial action more broadly. This has implications for understanding how and why entrepreneurial action is taken and fluctuates over time.

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REFERENCES


Cuervo-Cazurra & Un, 2010; Filatotchev & Piesse, 2009; Levesque et al., 2012


## Table 1. Summary Statistics for Attribution

<table>
<thead>
<tr>
<th>Attribution Type</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>6.78</td>
<td>5.93156</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>External</td>
<td>4.22</td>
<td>4.56066</td>
<td>0</td>
<td>31</td>
</tr>
<tr>
<td>Positive</td>
<td>6.84</td>
<td>6.93363</td>
<td>0</td>
<td>33</td>
</tr>
<tr>
<td>Negative</td>
<td>4.16</td>
<td>4.75399</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>intp</td>
<td>4.44</td>
<td>5.15286</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>intn</td>
<td>2.34</td>
<td>2.71628</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>extp</td>
<td>2.4</td>
<td>2.81769</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>extn</td>
<td>1.82</td>
<td>2.82621</td>
<td>0</td>
<td>17</td>
</tr>
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</table>

## Table 2. Summary Statistics for DV, IVs and control variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ Fut R&amp;D</td>
<td>454.374</td>
<td>1385.026</td>
<td>0.048</td>
<td>8434</td>
</tr>
<tr>
<td>Δ Liquidity</td>
<td>135.2266</td>
<td>856.1074</td>
<td>1193.475</td>
<td>6014.7</td>
</tr>
<tr>
<td>Δ Net Sales</td>
<td>97.72335</td>
<td>537.3335</td>
<td>-1418.3</td>
<td>3086</td>
</tr>
<tr>
<td>Total Assets</td>
<td>4100.394</td>
<td>14743.49</td>
<td>2.747</td>
<td>117565</td>
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</table>

## Table 3. Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Δ Fut R&amp;D</th>
<th>Δ Liquidity</th>
<th>Δ Net Sales</th>
<th>Intp</th>
<th>Intrelative</th>
<th>Intpratio</th>
<th>Total Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ Fut R&amp;D</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Δ Liquidity</td>
<td>0.6283*</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Δ Net Sales</td>
<td>0.3529*</td>
<td>0.2189*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intp</td>
<td>0.4599*</td>
<td>0.3073*</td>
<td>0.4382*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrelative</td>
<td>0.2488*</td>
<td>0.2152*</td>
<td>0.4450*</td>
<td>0.8801*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intpratio</td>
<td>0.0274</td>
<td>0.0509</td>
<td>0.1745</td>
<td>0.5720*</td>
<td>0.6957*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total Assets</td>
<td>0.9554*</td>
<td>0.5160*</td>
<td>0.1515</td>
<td>0.3793*</td>
<td>0.1479</td>
<td>0.0093</td>
<td>1</td>
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</table>

Note: * indicates significant correlation at 5% or lower level
Table 4. The Effect of Change in Liquidity on Future R&D when moderated by Attribution

<table>
<thead>
<tr>
<th></th>
<th>All Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DV: Δ Fut R&amp;D</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ Liquidity</td>
<td>0.2939127**</td>
<td>0.3219643**</td>
</tr>
<tr>
<td></td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>Intpratio</td>
<td>99.06518</td>
<td>96.03854</td>
</tr>
<tr>
<td></td>
<td>73.27</td>
<td>167.42</td>
</tr>
<tr>
<td>Interaction</td>
<td>0.7840411**</td>
<td>0.7946588**</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
<td>0.25</td>
</tr>
<tr>
<td>Total Assets</td>
<td>0.0795798**</td>
<td>0.0781274</td>
</tr>
<tr>
<td></td>
<td>0.24</td>
<td>0.01</td>
</tr>
<tr>
<td>Constant</td>
<td>445.6982**</td>
<td>884.0231</td>
</tr>
<tr>
<td></td>
<td>32.66</td>
<td>65.05</td>
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<td>No. of Observations</td>
<td>100</td>
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<tr>
<td>R-squared</td>
<td>0.947</td>
<td>0.9442</td>
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</table>

Figure 1. The Effect of Change in Liquidity on Future R&D Spending moderated by Performance Attribution
Figure 2. The Interaction Effect between Change in Liquidity and Attribution on Future R&D Spending (Full Sample)

Figure 3. The Interaction Effect between Change in Liquidity and Attribution on Future R&D Spending (Full Sample)
Figure 4. Effect of Change in Performance on Future R&D Spending mediated by Performance Attribution

Figure 5. Direct & Indirect Effects of Change in Performance & Attribution on Future R&D