

OPTIMISTIC ENTREPRENEURS AND NEW PRODUCT INTRODUCTIONS IN HIGH TECHNOLOGY INDUSTRIES¹

R. Isil Yavuz

Faculty of Business

Özyeğin University

Istanbul 34794, Turkey

E-mail: isil.yavuz@ozyegin.edu.tr

Dev K. Dutta

Peter T. Paul College of Business and Economics

University of New Hampshire

Durham, NH 03824, USA

dev.dutta@unh.edu

Mehmet Soytas

Faculty of Business

Özyeğin University

Istanbul 34794, Turkey

E-mail: mehmet.soytas@ozyegin.edu.tr

¹ We greatly acknowledge the support of the Ewing Marion Kauffman Foundation in providing access to the KFS data in the NORC Data Enclave. All errors remain ours.

ABSTRACT

This study examines how the relationship between past performance and new product introductions is influenced by entrepreneurial optimism. Based on the behavioral theory of the firm, we test how past performance suggest low performance relative to aspirations helps new ventures initiate strategic change, such as new product introductions. In contrast, high performance relative to aspirations tends to reinforce *status quo*. Moreover, we argue that when past performance falls below aspirations, new ventures founded by optimistic entrepreneurs are more likely to introduce new products than those with less optimistic entrepreneurs. We test our hypotheses using data from the Kauffman Firm Survey on 333 newly founded high technology new ventures in the U.S. Our results strongly support our interaction hypothesis. After controlling for the impact of several entrepreneurial and firm-level characteristics, we show that the rate of new product introductions is highest in ventures founded by optimistic entrepreneurs where the ventures have shown low prior performance relative to their aspirations.

Keywords:

Behavioral Theory, Entrepreneurial Optimism, Innovation

INTRODUCTION

Introduction of new products has become critical for firm growth, profitability and survival, especially in high technology sectors characterized by intense competition, shortened life cycles and increasingly global markets (Dowell & Swaminathan 2000). However, new product introduction is a risky initiative, and with uncertain outcomes. Statistics show that three-quarters of the money spent in product development investments results in failure (Christensen & Raynor, 2003). Thus, introducing a “good” product can make a company just as a “bad” one can break it. This is especially true for young companies that have little or no slack resources to buffer themselves against the risk of failure (Bolume, Calantone, Benedetto & Melnyk, 2015; McKendrick & Wade, 2009). Further, prior research has confirmed that in new firms founder psychological characteristics have a significant impact on the venture’s emerging trajectory (Protogerou, Caloghirou & Vonortas, 2017). Accordingly, in this study we examine *whether and how founder dispositional optimism – an important psychological characteristic - interacts with performance feedback to affect new product introductions by high technology new ventures*. Our research is motivated by several considerations, noted below.

Researchers attempting to understand risky organizational actions such as new product introductions often draw insights from the behavioral theory of the firm (Cyert & March, 1963). According to the behavioral theory, firms performing below aspirations tend to take risks and initiate strategic change, in order to improve performance to a satisfactory level. On the other hand, firms operating at or above aspirations tend to maintain the *status quo* (Cyert & March, 1963, Bromiley, 1991, Greve, 2003; Chen & Miller, 2007, Greve, 2010). However, most insights on the effect of past performance on risky organizational actions such as new product introductions have been generated in the context of large, well-established public companies. These companies tend to be resource rich and are thus in an advantageous position with regard to investing in new products

as performance falls short of aspiration levels. This is because having a performance decline during a period does not necessarily mean resource shortage (Greve, 2003; Chen & Miller, 2007). But this is not the case with resource constrained new ventures. Further, the impact of deviations in performance on new product introduction decisions in young, entrepreneurial ventures remains understudied.

The importance of financial slack in undertaking risky activities, when performance falls below aspiration, has been extensively studied (Cheng & Kesner, 1997; Musso & Schiavo, 2008). By buffering organizations from the threat of failure, financial slack allows managers to take more risks to bridge performance gap. On the other hand, when threatened by low performance and in the absence of access to slack resources, managers tend to become rigid and avoid taking risks (Audia & Greve, 2006; Tyler & Caner, 2016; Lungenau, Stern & Zaja, 2016). Although this research has increased our understanding of how financial slack increases risk-taking behavior in response to poor performance feedback in well-established, large companies, the applicability of these findings to young entrepreneurial ventures remains limited (Knight, Madsen & Servais 2004).

Because of the “liabilities of newness” (Stinchcombe 1965), new and young ventures face enormous difficulty in accessing resources even when they try hard. For new ventures with a limited prior history of operations, attracting additional resources from external resource providers often depends on the evidence of positive emergent trends in performance (Lichtenstein & Brush, 2001). Accordingly, young ventures tend to take riskier actions when performance is same or above aspirations, compared to when performance is below aspirations (Wennberg, Delmar & Mckelvie, 2016). So, significant questions remain unanswered as to how new and young ventures, with a limited history of performance and low resources, consider risky strategic initiatives such as new product introductions, in response to performance feedback? Do low-performing new ventures risk everything and introduce new products to attain higher performance as behavioral theory would

suggest, or do they continue with the same course of action given that low performance already threatens their survival? Do high-performing new ventures just maintain status quo, or are they more likely to introduce new products since they are in a position to accumulate and attract more resources for investment into new products?

We believe that by taking into account the founder's psychological characteristics may help untangle the puzzle. Prior studies adopting the behavioral theory perspective have analyzed the decision making processes in well-established organizations, emphasizing the importance of dominant coalition and organizational politics in arriving at strategic decisions (Greve, 2008). So far, researchers studying new ventures have not sufficiently explored the impact of psychological characteristics of entrepreneur-founders on the relationship between performance feedback and risky actions such as new product introductions. In the relatively complex and multilayered organizational structures of well-established companies where coalitions of political actors engage in negotiations and quasi resolution of conflict in deciding new strategic actions, it is likely that the impact of personal characteristics of each individual manager in strategic decisions does not matter significantly. But this would be just the reverse in entrepreneurial ventures that are founder driven. How founders interpret past performance can have a major influence on new strategic actions since they are the organization's primary decision makers (McMullen & Shepherd, 2006). Accordingly, authors such as Dew *et al.* (2008) have suggested that if the behavioral theory of the firm is applied to an entrepreneurial setting, it needs to consider creative action by entrepreneurs based on performance feedback, and especially with due cognizance of the entrepreneur's psychological characteristics.

An essential trait of entrepreneurs is their dispositional optimism, or the proclivity to achieve positive outcomes even when such expectations do not have a rational justification (Hmielski and Baron, 2009). Prior research has documented that entrepreneurial optimism is a

positive motivating force that brings about change (Dushnitsky, 2010). We argue that exploring performance feedback in conjunction with founder optimism will yield a more nuanced understanding of the nature of new product introductions in new ventures, based on performance feedback. Our supposition is that entrepreneurial optimism significantly affects the relationship between past performance and new product introductions such that when the performance is below aspirations, it is the new ventures with optimistic founders that are going to perceive past performance as a warning for an urgent need for change and take risky actions to restore declining performance with the positive expectation that new product introductions will be successful. New ventures with less optimistic founders, on the other hand, will perceive low performance as a threat to their very survival and will not take any additional risks by introducing new products with the expectation that new initiatives are not going to be successful. In contrast, when performance is above expectations, we do not expect entrepreneurial optimism to factor in with regard to these decisions.

We test our hypotheses by examining 333 high technology new ventures. Our data came from the Kauffman Firm Survey (KFS) – a large panel dataset of new ventures in the US. Since we examine a large number of new ventures (both successful and unsuccessful) over time, this also helps us address the issue of reverse causation and survivor bias. While prior studies typically measured performance feedback by using objective measures, we use both objective and subjective measures. By addressing these empirical issues, we believe our study is advancement in the quantitative empirical examination of behavioral theory of the firm as applied in the context of new ventures.

The study's principal contribution is to bridge an important theoretical gap in behavioral theory by linking it to the context of entrepreneurial ventures, and in the high-tech business environment. By taking into account the distinctive nature of startup companies, our research

examines how response to performance feedback in new ventures operating with limited resources is contingent on the personal characteristics of their founders. We theorized for and find evidence that while there is no significant main effect of past performance on new product introductions, there is a significant interaction effect between founders' optimism and performance feedback on new product introductions. Specifically, new ventures with more optimistic founders are more likely to introduce new products when performance is below aspirations compared to their less optimistic counterparts. These findings are important not only because our theoretical knowledge of the behavioral implications of performance feedback in an entrepreneurial setting has been limited, but also given that competitiveness of companies depends on their ability to continuously innovate and introduce new products, this knowledge is practically important for those (i.e., entrepreneurs, capital providers, policy makers) who are concerned with increasing new product introductions in new ventures.

THEORY AND HYPOTHESES

Behavioral Theory of the Firm

Emerging out of work conducted in the Carnegie School, Cyert & March's *Behavioral Theory of the Firm* (BTOF) essentially takes the firm to be a political coalition (Augier & March, 2008). The theory is based on the insight that several broader questions of firm behavior cannot be satisfactorily answered by a conventional economic theory of the firm focusing on aggregation and outcomes based on prices and quantities (Gavetti, Greve, Levinthal & Ocasio, 2012). In contrast, by adopting a process view, BTOF makes a commitment to develop a more nuanced understanding of organizational reality, based on the following: (i) focusing on a small number of key economic decisions, (ii) developing process-oriented models of the firm, (iii) linking these models with empirical observations as closely as possible, and (iv) developing a theory that can be generalized and encompasses organizations beyond the specific firms studied (Argote and Greve, 2007). Under

the BTOF, firms come to be viewed as goal-directed systems, influenced not so much by pure economic goals but by aspirations based on internal bargaining among a dominant coalition, variant structures, simplified routines, internal bargaining and negotiations, and constrained resources (Argote & Greve, 2007; Augier & Prietula, 2007; Chen, 2008), with organizational action spurred by comparisons of realized goal variables against aspirations (Greve, 2008). In effect, decision-makers engage in quasi-resolution of conflict, uncertainty avoidance, problemistic search, and organizational learning, in order to arrive at acceptable solutions through factoring problems into sub-problems and arriving at acceptable solutions based on application of stand operating procedures (Augier & March, 2008). Cyert & March introduce a set of cognitive assumptions that serve as a set of decision-rules, guiding the action of the firm's dominant coalition: (i) Satisficing, which means that individuals do not maximize but rather choose the very first among a series of alternative courses of action that seems satisfactory; (ii) Search, which occurs because individuals are boundedly rational and must search for the alternatives since information and knowledge do not naturally flow to them; and (iii) Use of routines and decision rules, because individuals must operate under significant uncertainty and decision rules or standard operating procedures help them to make satisficing decisions that are deemed acceptable (Gavetti *et al.*, 2012).

According to Chen (2008), BTOF is the first systematic theory of a firm's backward-looking, problemistic search behavior. The search is backward-looking because it is conducted in the vicinity of the problem and existing solutions that may be available (Gavettei *et al.*, 2012). Therefore, the firm's decision-makers compare performance against aspirations, initiating organizational change based on acceptance of risk and adjustment of problemistic search (Greve, 2008), leading the decision calculus to be adaptively rational and based on organizational learning and feedback (Seth & Thomas, 1994).

Performance Feedback and New Product Introductions

One of the fundamental tenets of BTOF is that when faced with imperfect information and in view of their own bounded rationality, decision-makers end up satisficing with regard to performance expectations rather than optimizing on performance targets (Cyert & March, 1968). Levinthal & March (1981) suggest the firm's managers follow an adaptive model of decision-making, which connects aspirations, actual performance, and adaptation for the future. Decision-makers set up *ex ante* organizational performance aspirations. These are compared against actual performance achieved. Depending on the discrepancy between aspiration and performance, decision-makers may go for strategic reorientation and change. In other words, managers look to past performance as a signal of success or failure, in order to determine managerial action (Cyert & March, 1963; Levinthal & March, 1981). Low performance relative to aspirations is taken to be a problem. To raise performance above the aspiration level, firms search for alternative solutions, undertaking new strategic initiatives such as new product introductions. High performance relative to aspirations, on the other hand, causes managers to maintain the current operations and limit new strategic initiatives (Levinthal & March, 1981, Greve, 1988, Bromiley, 1991; Chen & Miller, 2007, Chen, 2008).

In support of these arguments, for example, Greve (1998) found in a study of the radio broadcasting industry that the more radio stations performed below their aspiration levels, the more they were to take risks and introduce new program formats. Similarly, by examining more than 25,000 companies in the US manufacturing industry, Chen & Miller, (2007) found that as the performance falls below aspirations, firms risk taking behavior in terms of R&D intensity increases. That is, as per the behavioral theory perspective, we expect that the probability of introducing a new product is higher when past performance is below aspirations than when past performance is same as or above aspirations.

While the decision-maker's aversion to take risks when performance is above aspiration has been well-documented, what happens when performance falls below aspiration is still debated. Researchers have highlighted the important role of slack resources in moderating the relationship between low performance and risk-taking. Based on the shifting focus model of risk-taking (March & Shapira, 1987, 1992, Audia & Greve, 2006), it has been suggested managers become risk-seeking when there is excess financial resources, or slack, because slack serves as a buffer against the threat of failure, helping managers to take actions to close the performance gap. In contrast, managers become risk-averse when slack resources are limited, because low performance is perceived as a threat to survival and this perception makes managers more rigid and decrease risk-taking.

For example, Audia & Greve (2006) examined well-established Japanese public companies in the shipbuilding industry and demonstrated that low performance either did not affect or increased risk-taking in resource-rich large firms while it decreased risk-taking in small firms. Tyler & Caner (2016) examined publicly traded US biopharmaceutical companies and demonstrated that as firms perform below their aspiration levels, they tend to search for new initiatives (i.e., R&D alliances) and the amount of slack resources positively moderates this relationship. Lungenau, Stern & Zajac (2016) studied publicly listed US pharmaceutical companies and showed that firms with greater level of financial slack responded to poor innovative performance by increasing investments in more innovative vehicles while firms with less financial slack responded to poor performance by reducing investments in more innovative vehicles and reverting to more familiar ones.

These studies have shown how firms respond to low performance depends on the level of slack such that when performance is below aspirations, ventures with no slack are more likely to be risk averse compared to ventures with slack. Because these empirical studies have not considered how new ventures with limited resources respond to high performance, it is not very clear whether low or high performance leads to more risk aversion in the context of new ventures. However, the

behavioral theory perspective suggests that even with limited resources, new ventures would take more risks when performance is below aspirations compared to when performance is above aspirations because “the desire to overcome a performance failure is stronger than the desire to extent success, so decision makers below aspiration level accept more risks than decision makers above aspiration level” (Audia & Greve, 2006, pg. 84). This leads us to the following hypothesis:

Hypothesis 1a: *The probability that an entrepreneurial venture introduces a new product is higher when past performance is below aspirations than when past performance is the same as or above aspirations.*

Since the aforementioned studies mostly examined well-established companies, some entrepreneurship scholars recently highlighted that firm age as well as its size changes the way ventures respond to positive and negative performance feedback (Wennberg, Delmar & Mckelvie, 2016). These researchers argue that new ventures are very different from well-established companies because not only do they have very limited resources but also they lack prior history and established routines for decision-making. In the early stages of their lifecycle, new ventures engage in bringing in their initial products or services to the market, developing relationships with customers and suppliers, and establishing organizational processes and procedures. Therefore, when surrounded by uncertainty regarding the viability of the venture and the market potential during those initial years, new ventures become especially attentive to emerging performance trends and adjust both their aspiration levels and their preference to take risks (Wennberg, Delmar & Mckelvie, 2016). According to this group of researchers, when performance falls below the aspiration level, younger ventures are likely to take this initial feedback as an indication of the true potential of the venture, more likely to admit failure and adjust their aspiration downwards, which decrease risk-taking. Moreover, because low performance presents a direct threat to venture survival in the case

of new ventures with limited resources and the inability to attract more resources even when they try (also called liabilities of newness), these ventures tend to avoid risky actions such as new product introductions when their performance is below the aspiration level (Wennberg, Delmar & Mckelvie, 2016). On the other hand, when performance is above the aspiration level, young ventures easily update their aspirations upwards because “positive performance enhance entrepreneurs’ beliefs about demand for their products or services and their own abilities, encouraging them to adjust aspiration levels upwards and increase risk taking toward growth (Wennberg, Delmar & Mckelvie, 2016, pg 413).” Moreover, high performance also provides these ventures with an increased ability to accumulate and attract resources necessary for introducing new products (Bolummole, Calantone, Benedetto, Melnyk, 2015). This leads us to the following hypothesis:

***Hypothesis 1b:** The probability that an entrepreneurial venture introduces a new product is higher when past performance is same as or above aspirations than when the past performance is below aspirations.*

The Moderating Effect of Founder Optimism

While the BTOF assumes that decision makers tend to be satisfied with good performance and strongly wish to avoid bad outcomes, research based on the entrepreneurship perspective suggests entrepreneurs are not easily satisfied with good performance and strive for even higher levels of performance outcomes. At the same time, compared to managers, entrepreneurs also tend to have a higher tolerance for failure. Further, because new ventures do not have much of an operating history and established routines, personal characteristics of the founder-entrepreneur become crucial to consider in the venture’s decision-making process. In high-tech industries, especially, where the rapidly evolving external environment is fraught with technological uncertainty and ambiguity, the

ways in which entrepreneurs make sense of their environments and decide on new strategies is largely influenced by individual differences (Shane, Locke & Collins, 2003). One important factor of individual difference is the founder's level of optimism, a disposition that represents the proclivity to achieve positive outcomes even when such expectations do not have a rational justification (Hmielski & Baron, 2009).

Conceptualized as having both a state and a trait component (Kluemper, Little & DeGroot, 2009), optimism is "...the extent to which people hold generalized favorable expectancies for the future" (Carver, Scheier & Segerstrom, 2010: 879). As a psychological trait measuring individual differences, optimism has been found to be related to four out of the five major factors of personality: neuroticism, extraversion, agreeableness and conscientiousness (Sharpe, Martin & Roth, 2011; Williams, 1992). In general, optimistic individuals tend to be happier, popular, and more considerate of and helpful toward others (Taylor & Brown, 1988; Uchbasaran, Flores & Westhead, 2007).

Treated primarily as a cognitive characteristic (Peterson, 2000), optimism leads individuals to develop behaviors and strategies aimed at managing emotions and stress in the face of uncertainty (Nes and Segerstrom, 2006). It makes them believe they are likely to experience more positive outcomes and less negative outcomes, compared to others like themselves (Darvill & Johnson, 1991; Lipkus, Martz, Panter, Drigotas & Feaganes, 1993), especially in the near future (Lipkus *et al.*, 1993). Therefore, it comes as no surprise that, in general, entrepreneurs are found to display higher levels of optimism than non-entrepreneurs (Uchbasaran, Westhead, Wright & Flores, 2012).

With regard to the impact of optimism on entrepreneurial performance, results of previous studies remain inconclusive. Some researchers have found optimism to be beneficial in entrepreneurial pursuits (Dawson & Henley, 2012). This occurs through raising entrepreneurial curiosity (Jeraj, 2014), enabling individuals to increase creative outcomes, based on the mediating

influences of positive affect and positivity ratio (i.e. the ratio between the frequency of positive and negative affective states) (Rego, Sousa, Marques & Pina e Cunha, 2012). In turn, optimism has a positive impact on entrepreneurial success (Chen, Liao, Redd & Wu, 2013; Crane & Crane, 2007). Yet, other authors (e.g. Hmielski & Baron, 2009) find that in new ventures optimism is negatively related to performance of new ventures, which makes them conclude highly optimistic entrepreneurs tend to misjudge the riskiness associated with their projects (Palich and Bagby, 1995). Inconclusive findings of the impact of optimism on new venture outcomes have led some authors to distinguish between optimism in general and unrealistic optimism (Coelho, 2010; Regan, Snyder & Kassin, 1995), and optimism and overconfidence (Astebro, Herz, Nanda & Weber, 2014). Others (e.g. Sweeny, Carroll & Shepperd, 2006) have suggested additional factors might be at play, e.g. people shifting away from an optimistic outlook in response to new information or upon the understanding that outcomes may not turn out as originally hoped.

Even though the two views about the potential impact of optimism on venture performance remain irreconcilable, there is no doubt that optimism has a decidedly positive impact on entrepreneurial motivation and action in the face of change. It has been noted that optimism is significantly associated with measures for coping (Anderson, 1996). Aspinwall, Richter & Hoffman (2001) note, in general optimists are more effective than pessimists at processing negative information, and processing such information more thoroughly and flexibly. The positive affect associated with optimism raises entrepreneurial curiosity (Jeraj, 2014), leading individuals to put more effort on the search process (Papenhausen, 2010), enhancing creative behavior (Rego *et al*, 2012) when faced with change. Further, Hayward, Shepherd & Griffin offer the hubris theory of entrepreneurship to suggest that ways in which founders socially construct their confidence levels does have an impact on the manner in which they interpret information relating to their current and previous ventures, leading them to initiate action. Based on these arguments about the positive role

of optimism in spurring entrepreneurial action, we argue that optimistic entrepreneurs will tend to respond to performance shortfalls with continuing efforts to solve problems and introduce new strategic initiatives, to try and improve future performance. In contrast, unoptimistic entrepreneurs will tend to disengage themselves from the issue instead of actively trying to solve the performance problem they are beset with. As such, in our view optimistic entrepreneurs are more likely to respond to failure by initiating new strategic initiatives such as going for new product introductions, with the hope that the new initiatives will succeed and raise future performance. Unoptimistic entrepreneurs, on the other hand, will lose the momentum for action when faced with performance declines. Therefore, we suggest the following hypothesis:

***Hypothesis 2:** The level of founder optimism moderates the relationship between past performance and new product introductions such that when performance falls short of aspirations, new ventures founded by more optimistic founders are more likely to introduce new products relative to those founded by less optimistic founders.*

DATA and METHODS

Sample

Firm level data to test the hypotheses come from a secondary data source – the Kaufmann Firm Survey (KFS), which is a large panel data set of new businesses founded in the US in 2004. The data set consists of an initial and seven follow up surveys (of the same firms) in from 2004 to 2011 done by the Kaufmann Foundation. The firms included in the survey come from a randomly chosen sample of new businesses in the Dun & Bradstreet (D&B) list, with high-tech firms intentionally oversampled by the Kaufmann Foundation. High technology firms are defined based on the categorization by Hadlock, Hecker & Gannon (1991). This definition considers the industry percentage of R&D employment and classifies the businesses into technology groups based on the following two digits SIC codes: 28: Chemicals and allied products, 35: Industrial machinery and

equipment, 36: Electrical and electronic equipment and 38: Instruments and related products. Because KFS follows the same cohort of firms over time (eight years from 2004 to 2011), it helps us observe past performance during the first four years and observe new product introductions during the next three years. Therefore, in our study, from the 705 high technology firms in the sample in 2004, we limit the data to the set of firms that are present in in 2008, which reduces the sample size to 344.

Table 1 provides a brief overview of the dependent, independent, moderator and control variables and measures. The dependent variable is new product introduction, measured as a discrete variable every year from 2008 to 2011 and coded 1 if the venture introduced at least one new product to the market in that year and 0 otherwise. This operationalization is consistent with prior literature (e.g., Brancati, 2015). A version of this variable captures the number of new products after 2008, and analysis with this measure is used as a robustness check. In the final sample, 52 % of the surviving firms introduced at least one new product to the market between 2008 and 2011.

[Insert Table 1 here]

We measure our independent variable, past performance relative to aspirations, or performance feedback, with the following question: *“I would like you to think about how much you expected to your business to grow since the business was started. How much do you think your business met your expectations for growth between when the business started (2004) and 2008”?* *Would you say your business’s growth a) Exceeded, b) Met, or c) Did not meet your expectations?* We coded 1 if the answer is “exceeded”, or “met”, and coded 0 if the answer is “did not meet expectations”. About 49% of the sample stated that they met or exceeded their performance expectations, while 51% stated that they did not meet their growth expectations. As a robustness check, we also compared this self-reported performance feedback measure with the actual revenue

data for each year from 2004 to 2008 and found a significant positive correlation in the range of 0.15 and 0.20 between our self-reported performance feedback measure and the actual revenue data.

Our moderator variable, founder optimism is measured in 2008 as 5-point scale item to the question “*In uncertain times, I usually expect the best.*” We constructed two optimism variables. The first measure utilizes the full range of the 5-point scale with a higher value indicating more optimistic founders. The other variable is a dummy variable and coded 1 if the primary founder² answered 4 or 5 to the above question and 0 otherwise. Using this dummy variable, we found that 61 % of the founders were optimistic. Table 2 indicates the percentage of new product introductions as categorized by performance feedback and founder optimism.

One concern one might have is that founder optimism is measured by a single item, not by a full scale. Since our data comes from secondary sources, we cannot directly address this limitation. However, we tried to overcome this limitation by assessing the strength of our single item in the full optimism scale. To do this, we surveyed 118 undergraduate business students by using Life Orientation Test Revisited (LOT-R) developed by Scheier & Carver (1992), which is commonly used by psychologist as a robust tool to measure optimism (e.g., Burke et al., 2006; Creed, Patton & Bartrum, 2002; Sydney, et. Al, 2005).

The original LOT-R has three positive statements (optimism measures), three negative statements (pessimism measures), and four non-scored items as filler statements. Three optimism items were: (1) *In uncertain times, I usually expect the best* (which is also our measure of optimism in this study), (2) *I am always optimistic about my future*, and (3) *Overall, I always expect more good things happen to me than bad*” The responses to three optimism questions have 5-point scale

² For new ventures with more than one founder, the primary founder is defined as the founder who has the largest equity share of the company. If founders have equal equity shares, then primary owner is designated as the one who is more involved with the day to day operations. In the final sample, 56% of the new ventures have one founder, while 30% have two founders, 10% have three founders and 4% have four or more founders.

with a higher value indicating higher optimism. In the past, entrepreneurship researchers have utilized this three-item scale to measure founder optimism (e.g., Liang & Dunn, 2010).

First, we did a reliability analysis and calculated item-total correlation and Alpha if item deleted correlation to evaluate the contribution of the first item (the item used in our study) to the overall internal consistency of this three-item scale. The reliability of the scale or Cronbach's alpha is 0.548, implying good internal consistency. Item-total correlation is 0.355, indicating the first item is highly correlated with the other two items. Alpha item is deleted correlation is 0.453, indicating that the reliability of the full scale would decrease from 0.548 to 0.453 if the first item is deleted, indicating the first item is a strong item in the scale to measure optimism. Next, we did a factor analysis to see if the first item loads heavily on the full scale. Our results show that the first item has the highest eigenvalue (1.590) and explains 53% of the variance, increasing our confidence in using the first item as a measure of founder optimism in our study.

[Insert Table 2 here]

We incorporated a comprehensive set of control variables to account for alternative explanations. First, we included gender since prior research shows that male founders have tendency to take more risks compared to their female counterparts (Reavley et. al, 2005) and hence male founders may be more likely to introduce new products. We included education since prior studies demonstrated a positive relationship between the education level of founders and new product introductions. We also included the average number of hours the primary founder work for his/her start up, since the effort founders put in their venture directly affects their risk perception. We control number of owners as a control variable since prior research shows that individuals and groups behave differently in taking risky decisions. We also included number of employees to account for the capability of the new ventures to introduce new products and total assets to account for the availability of the resources for new product introductions. Finally, we controlled for an

important factor in the industry environment: whether the industry is technology generating or not. Although our sample consists only of high technology new ventures, the speed of new product introductions may still vary within the high technology industries. Therefore, following Chapple et al. (2004), we controlled if the industry is technology generating, which is characterized by higher intensity R&D expenditure and R&D employment, making new product introductions more likely in these industries. We also used two-digit SIC Industry dummies as control variables in our robustness checks.

Estimation Strategy

Our empirical strategy depends on identifying the effects of performance feedback on new product introductions (Hypothesis 1a and 1b), the interaction effect of performance feedback and founder optimism on new product introductions (Hypothesis 2). We observe the firms in our sample three years into the future after learning about their past performance relative to their aspiration levels and their founders' optimism. Therefore, we construct measures of our dependent variables (1) as an aggregate binary outcome, which is equal to 1 if the firm for instance introduces a new product in any year over the three years period; (2) a year-based binary outcome which is equal to 1 if the firm introduces a new product in that year.

Due to the binary nature of the dependent variable in both constructs, our main econometric method is logit estimation. However, the measure constructed by the second method will give us a panel data (3 years) structure where we will use standard logit (to analyze the variation in the time of the new products introduced) but also logit with random effects in order to control for the firm level heterogeneity. Robust standard errors will be calculated in all specifications, and time fixed effects will be included in the panel logit estimation. The random effect specification in the logit estimation does not allow dependence of the firm heterogeneity to the other control variables. However, Audia and Greve (2006) report that in their study they found firm fixed effects were not

significant, and a random effects structure fits to their data better. Thus, in the main estimations two measures, and for each measure, three models will be considered. Estimations will be performed via standard maximum likelihood in the basic logit case, and will be conducted via maximum likelihood estimation with simulated random effects using Gaussian Quadrature in the panel logit with random effects case. In the robustness part of the analysis we will extend the main estimations in various directions such as, (i) other measures of other risky actions such as new process introductions; (ii) analysis restricted to single owner firms; (iii) number of new products as the dependent variable to check the validity of the results under different specifications and measures.

RESULTS

Table 3 reports descriptive statistics and pair-wise correlations for all variables used in the main analyses. Pair-wise correlations among the variables are generally as expected. Consistent with prior literature, education, number of hours worked, number of owners, number of total employees, total assets and technology generating industry are all significantly and positively correlated with new product introductions in new ventures.

[Insert Table 3 here]

Table 4 reports the association of our independent variable - past performance relative to aspirations (hereafter performance feedback measure)- with the past log revenue measures of the firms in the upper panel. The one-year log revenues from 2004 to 2008 have a positive and statistically significant association with the performance feedback, ranging in value from 0.15 to 0.20. The bottom panel of Table 4 reports the results of the sample t-test for the equivalence of the means of the revenue increases from 2004 to 2008 of the firms that report that they met or exceed their expectations for growth or not respectively. We reject the equal means hypothesis with a p-value of 0.027, indicating that the revenue of those new ventures stating that they have met or exceeded their growth expectations are significantly different (and higher) from the revenue of new

ventures stating that they did not meet their growth expectations. This alignment between our performance feedback and the actual revenue data increases our confidence in our measures.

[Insert Table 4 here]

We used logistic regression to test Hypotheses 1a and 1b because our dependent variable new product introduction is a binary variable. Results are given in Tables 5. The first column in Table 5 indicates the effect of performance feedback on new product introductions without any control variables. The second column in Table 5 tests the same hypotheses by adding the set of controls for gender, age, founders' education, average number of hours the primary founder work, firm size, a dummy for whether the firm is in the technology generating industry. The third column uses all years of information from 2009 to 2011, but performs the estimation just pooling the available data. It adds additional set of controls for the year effects. However, it does not take into account the panel structure but treats each firm-year observation as independent. This increases the sample size to 344 to 851. Finally, column four presents the random effects logit model results taking into account the firm level heterogeneity in the panel context. In the estimation of random effects logit specification, Multivariate Gaussian Quadrature is used as the integration method and it is calculated at 12 points. In all the specifications, the coefficient of the aspiration measure is statistically non-significant, which suggests that past performance relative to aspirations does not have a significant main effect on new product introductions, failing to support Hypotheses 1a & 1b.

[Insert Table 5 here]

One main concern with the estimations regarding our first set of hypotheses might be the effect of selection bias on the results. The selection bias arises since our sample consists only of firms who are able to survive the first four years and manage to report their past performance relative to aspirations. These firms may differ in important ways from firms which did not survive. Although we try to include as many relevant variables as possible as controls, differences between

these two groups might be due to some unmeasured variables. For example, new firms which have performed superior relative to aspirations may be more likely to survive. To correct for the possible effect of selection bias and check our results validity under selection, we estimated a Heckman selection specification (Heckprobit specification in Stata). The mills ratio is not significant in the new product introduction equation (coefficient = -1.17, t-stat 1.17) and the coefficient of our main variable, performance feedback measure remains still insignificant (t-stats = 0.66).

Table 6 indicates the results for Hypotheses 2 regarding the moderation effect of founder optimism on the relationship between performance feedback and new product introductions. The results show that the moderating variable (performance feedback*founder optimism) significantly affects the relationship between performance feedback and new product introductions, providing support for our second hypothesis. In Table 6, the first 3 columns present the effects of founder optimism, performance feedback and their interaction respectively. In column 3 where the main effects and the interaction are added, we find that our moderating variable is significant with $z = -0.44$, $p < 0.05$. Analysis in column 6 is replicated using the extensive set of controls. In column 4 in Table 6, the results are presented when controls for gender, age, founders' education, average number of hours the primary founder work, firm size, total assets of the firm, a dummy for whether the firm is in the technology generating industry are included in the estimation. We again find that interaction term is statistically significant with $z = -0.37$, $p < 0.06$, supporting our second hypothesis. This result indicates that that the effect of past performance on new product introductions is contingent on the level of founder optimism.

[Insert Table 6 here]

To detail the interaction effect, we compared regression coefficients of high performing and low performing new ventures to see if founder optimism influences the probability of new product introductions significantly differently for low performing and high performing new ventures. Based

on column 3 in Table 6, our results show that while founder optimism has no significant effect on new product introductions in high performing new ventures (0.433 & - 0.441, with F-test with p-value = 0.953), founder optimism significantly increases new product introductions in low performing new ventures with a coefficient 0.433 and t-stat= 3.27, p =0.001. Same analysis is replicated using the extensive set of controls in column 4 in Table 6. We again find that while founder optimism has no significant effect on new product introductions in high performing new ventures (0.364 & -0.368, with F-test with p-value = 0.981), it increases the probability of new product introductions in low performing firms with a coefficient 0.364 and t-stat= 2.56, p =0.01

[Insert Figure 1 here]

One may think that whether the size of the differential effect of founder optimism the on the probability of new product introductions in high performing versus low performing new ventures is significant enough to produce a meaningful policy recommendation. Since the effect of founder optimism on the probability of new product introductions is insignificant in the case of high performing firms (0.433 - 0.441, with F-test with p-value = 0.953), we calculate the absolute effect of founder optimism in low performing firms. We use a logit model, so the outcome variable is the probability of a firm introducing a new product over the next three years. The marginal effect, i.e., the change in the probability of introducing a new product with respect to a change in the founder optimism variable is calculated by taking the derivative of the logit function with respect to the founder optimism. When we do that, an increase in optimism by one unit (on a scale of 1 to 5), increases the probability of introducing a new product by 10.33%. Given that, 52 % of the surviving firms introduce at least one new product to the market from 2008 to 2011, this implies a 20% increase in the probability of product introductions for low performing firms. We have performed extensive robustness checks for our results, presented in the Appendix 1.

DISCUSSION AND IMPLICATIONS

We drew on the behavioral theory of the firm to examine the interplay between performance feedback and entrepreneurial optimism leading to new product introductions in high technology new ventures. We had argued that low performance relative to aspirations stimulates new product introductions (Hypothesis 1) and entrepreneurial optimism strengthens this relationship (Hypothesis 2). We tested our hypotheses using data from the Kauffman Firm Survey on a cohort of 333 high-tech new ventures founded in the U.S. Our results did not provide empirical support for our first hypothesis, but strongly supported our second hypothesis, meaning that low prior performance relative to aspirations significantly increases new product introductions in ventures founded by optimistic entrepreneurs. This is an important finding. It suggests that in high-tech entrepreneurial ventures simply recognizing performance deviations against aspirations by the entrepreneur is not enough, in order to usher in strategic change. What is also required is a high level of optimism on the part of the entrepreneur. New product introduction in high-tech entrepreneurial ventures is fraught with risk and uncertainty (Hora & Dutta, 2013). As such in the face of a negative consequence such as falling short on aspirations, the entrepreneur definitely needs to be optimistic in order to go ahead with new product introduction, with the hope that this will stem the downward slide in performance vis-à-vis initial aspirations and redress the situation through performance improvement in future. In effect, our study results reiterate the positive impact of certain personality variables of the individual on entrepreneurial success (Shaver & Scott, 1991). The validity of important role of entrepreneurial optimism was reinforced through a series of robustness tests, which supported that optimistic entrepreneurs tend to initiate strategic change based on new product introductions when performance falls short of aspirations.

Our study contributes to strategic management and entrepreneurship literature in three primary ways. First, we begin to fill an important theoretical gap in BOTF literature, which has

focused primarily on the well-established companies. By taking into account the distinctive nature of startup companies, we theoretically incorporate and empirically document the role of entrepreneurial optimism in the relationship between past performance and new product introductions. This understanding is important not only because our theoretical knowledge of the behavioral implications of performance feedback in an entrepreneurial setting happens to be very limited, but also because this knowledge is practically important for new ventures operating in dynamic and uncertain environments. In these environments, how entrepreneurs make sense of performance feedback in unique ways and take different strategic actions would be critical in determining differing firm performance (Shane, Locke & Collins, 2003). Therefore, an implication for future research would be to examine the effects of other entrepreneurial characteristics in the relationship between performance feedback and strategic actions in high-tech new ventures.

Second, our study methodologically contributes to the entrepreneurship literature. We examine a large number of new ventures over time and include a comprehensive set of control variables, helping us eliminate the various alternative explanations other than the variables of interest in this study. Given that most of the existing quantitative studies examining new ventures use a small number of firms, cross sectional design, limited number of controls, and suffers from reverse causation, this study is advancement in the empirical examination of new ventures.

Finally, given that, the competitiveness of new ventures especially in high technology industries depends on their ability to continually innovate and introduce new products; our findings would have important implications for entrepreneurs, investors and policy makers. Our results might benefit high-tech entrepreneurs in choosing their co-founders, investors in choosing their portfolio companies, and policy makers in devising training programs if they aim to encourage new product introductions by high technology new ventures.

References

- Andersson, G. (1996). The benefits of optimism: A meta-analytic review of the Life Orientation Test. *Personality and Individual Differences*, 21(5), 719-725.
- Argote, L., & Greve, H. R. (2007). A behavioral theory of the firm—40 years and counting: Introduction and impact. *Organization Science*, 18(3), 337-349.
- Astebro, T., Herz, H., Nanda, R. and Weber, R.A. (2014). Seeking the roots of entrepreneurship: Insights from behavioral economics. *Journal of Economic Perspectives*, 28 (3), 49-69.
- Audia, P.G. and Greve, H.R. (2006). Less likely to fail: Low performance, firm size, and factory expansion in the shipbuilding industry. *Management Science*, 52 (1), 83-94.
- Augier, M., & March, J. G. (2008). A retrospective look at a behavioral theory of the firm. *Journal of Economic Behavior & Organization*, 66(1), 1-6.
- Augier, M., & Prietula, M. (2007). Perspective—Historical Roots of the A Behavioral Theory of the Firm Model at GSIA. *Organization Science*, 18(3), 507-522.
- Bitler, M. P., Moskowitz, T. J., & Vissing- Jorgensen, A. (2005). Testing agency theory with entrepreneur effort and wealth. *The Journal of Finance*, 60(2), 539-576.
- Bolumole, Y. A., Calantone, R. J., Di Benedetto, C. A., & Melnyk, S. A. (2015). New product development in new ventures: the quest for resources. *International Journal of Production Research*, 53(8), 2506-2523.
- Brancati, E. (2015)., Innovation financing and the role of relationship lending for SMEs. *Small Business Economics*, 44(2):449-473.
- Bromiley, P. (1991). Testing a causal model of corporate risk taking and performance. *Academy of Management Journal*, 34(1), 37-59.
- Carver, C.S., Scheier, M.F. and Segerstrom, S.C. (2010). Optimism. *Clinical Psychology Review*, 30, 879-889.
- Chapple, W., Lockett, A., Siegel, D., & Wright, M. (2005). Assessing the relative performance of UK university technology transfer offices: parametric and non-parametric evidence. *Research Policy*, 34(3), 369-384.
- Chen, S., Liao, Z., Redd, T. and Wu, S. (2013). Laotian entrepreneurs' optimism and new venture performance. *Social Behavior and Personality*, 41 (8), 1267-1278.
- Chen, W. (2008). Determinants of firms' backward- and forward-looking R&D search behavior. *Organization Science*, 19 (4), 609-622.
- Chen, W. R., & Miller, K. D. (2007). Situational and institutional determinants of firms' R&D search intensity. *Strategic Management Journal*, 28(4), 369-381.
- Christensen, C., & Raynor, M. (2013). *The innovator's solution: Creating and sustaining successful growth*. Harvard Business Review Press.
- Coelho, M.P. (2010). Unrealistic optimism: Still a neglected trait. *Journal of Business Psychology*, 25, 397-408.
- Crane, F. G., & Crane, E. C. (2007). Dispositional optimism and entrepreneurial success. *The Psychologist-Manager Journal*, 10(1), 13.
- Creed, P. A., Patton, W., & Bartrum, D. (2002). Multidimensional properties of the LOT-R: Effects of optimism and pessimism on career and well-being related variables in adolescents. *Journal of Career Assessment*, 10(1), 42-61.

- Cyert, R. M., & March, J. G. (1963). A behavioral theory of the firm. *Englewood Cliffs, NJ*, 2.
- Darvill, T.J. and Johnson, R.C. (1991). Optimism and perceived control of life events as related to personality. *Personality and Individual Differences*, 12 (9), 951-954.
- Dawson, C. and Henley, A. (2012). Over-optimism and entry and exit from self-employment. *International Small Business Journal*, 31 (8), 938-954.
- Delmar, F., & Shane, S. (2006). Does experience matter? The effect of founding team experience on the survival and sales of newly founded ventures. *Strategic Organization*, 4(3), 215-247
- Dew, N., Read, S., Sarasvathy, S. D., & Wiltbank, R. (2008). Outlines of a behavioral theory of the entrepreneurial firm. *Journal of Economic Behavior & Organization*, 66(1), 37-59.
- Dowell, G., Swaminathan, A., & Wade, J. (2000). Pretty pictures and ugly scenes: Political and technological maneuvers in high definition television. In *The new institutionalism in strategic management* (pp. 97-133). Emerald Group Publishing Limited.
- Ey, S., Hadley, W., Allen, D. N., Palmer, S., Klosky, J., Deptula, D., ... & Cohen, R. (2005). A new measure of children's optimism and pessimism: The youth life orientation test. *Journal of Child Psychology and Psychiatry*, 46(5), 548-558.
- Gavetti, G., Greve, H. R., Levinthal, D. A., & Ocasio, W. (2012). The behavioral theory of the firm: Assessment and prospects. *Academy of Management Annals*, 6(1), 1-40.
- Greve, H. R. (1996). Patterns of competition: The diffusion of a market position in radio broadcasting. *Administrative Science Quarterly*, 29-60.
- Greve, H. R. (1998). Performance, aspirations, and risky organizational change. *Administrative Science Quarterly*, 58-86.
- Greve, H.R. (2003). A behavioral theory of R&D expenditures and innovations: Evidence from shipbuilding. *Academy of Management Journal*, 46 (6), 685-702.
- Greve, H. R. (2008). A behavioral theory of firm growth: Sequential attention to size and performance goals. *Academy of Management Journal*, 51(3), 476-494.
- Greve, H. R. (2010). Designing performance feedback systems to guide learning and manage risk. *Organizational Dynamics*, 39(2), 104-114.
- Hadlock, P, Hecker, D. & Gannon, J. (1991). "High technology employment: another view." *Monthly Labor Review*, 26-30.
- Hayward, M.L.A., Shepherd, D.A. and Griffin, D. (2006). A hubris theory of entrepreneurship. *Management Science*, 52 (2), 160-172.
- Hmieleski, K. M., & Baron, R. A. (2009). Entrepreneurs' optimism and new venture performance: A social cognitive perspective. *Academy of Management Journal*, 52(3), 473-488.
- Jeraj, M. (2014). The relationship between optimism, pre-entrepreneurial curiosity and entrepreneurial curiosity. *Organizacija*, 47 (3), 199-209.
- Kluemper, D. H., Little, L. M., & Degroot, T. (2009). State or trait: effects of state optimism on job-related outcomes. *Journal of Organizational Behavior*, 30(2), 209-231.
- Knight, G., Koed Madsen, T., & Servais, P. (2004). An inquiry into born-global firms in Europe and the USA. *International Marketing Review*, 21(6), 645-665.
- Levinthal, D. and March, J.G. (1981). A model of adaptive organizational search. *Journal of Economic Behavior and Organization*, 2 (4), 307-333.

- Liang, C. L. K., & Dunn, P. (2008). Are entrepreneurs optimistic, realistic, both or fuzzy? Relationship between entrepreneurial traits and entrepreneurial learning. *Academy of Entrepreneurship Journal*, 14(1/2), 51.
- Lipkus, I.M., Martz, J.M., Panter, A.T., Drigotas, S.M. and Feaganes, J.R. (1993). Do optimists distort their predictions for future positive and negative events. *Personality and Individual Differences*, 15 (5), 577-589.
- Lungeanu, R., Stern, I., & Zajac, E. J. (2016). When do firms change technology- sourcing vehicles? The role of poor innovative performance and financial slack. *Strategic Management Journal*, 37(5), 855-869.
- March, J. G., & Shapira, Z. (1987). Managerial perspectives on risk and risk taking. *Management science*, 33(11), 1404-1418.
- March, J. G., & Shapira, Z. (1992). Variable risk preferences and the focus of attention. *Psychological review*, 99(1), 172.
- McKendrick, D. G., Wade, J. B., & Jaffee, J. (2009). A good riddance? Spin-offs and the technological performance of parent firms. *Organization Science*, 20(6), 979-992.
- McMullen, J. S., & Shepherd, D. A. (2006). Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management review*, 31(1), 132-152.
- Nes, L. S., & Segerstrom, S. C. (2006). Dispositional optimism and coping: A meta-analytic review. *Personality and social psychology review*, 10(3), 235-251.
- Papenhausen, C. (2010). Managerial optimism and search. *Journal of Business Research*, 63, 716-720.
- Palich, L. and Bagby, D. (1995). Using cognitive theory to explain entrepreneurial risk taking: Challenging conventional wisdom. *Journal of Business Venturing*, 10, 425-438.
- Peterson, C. (2000). The future of optimism. *American psychologist*, 55(1), 44.
- Protogerou, A., Caloghirou, Y., & Vonortas, N. S. (2017). Determinants of young firms' innovative performance: Empirical evidence from Europe. *Research Policy*.
- Reavley, M. A., Lituchy, T., & McClelland, E. (2005). Exporting success: a two country comparison of women entrepreneurs in international trade. *International Journal of Entrepreneurship and Small Business*, 2(1), 57-78.
- Regan, P.C., Snyder, M. and Kassin, S.M. (1995). Unrealistic optimism: Self-enhancement or person positivity? *Personality and Social Psychology Bulletin*, 21 (10), 1073-1082.
- Rego, A., Sousa, F., Marques, C. and Pina e Cunha, M. (2012). Optimism predicting employees' creativity: The mediating role of positive affect and the positivity ratio. *European Journal of Work and Organizational Psychology*, 21 (2), 244-270.
- Seth, A., & Thomas, H. (1994). Theories of the firm: Implications for strategy research. *Journal of Management Studies*, 31(2), 165-192.
- Scheier, M. F., & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive therapy and research*, 16(2), 201-228.
- Shaver, K. G., & Scott, L. R. (2002). Person, process, choice. *Entrepreneurship: Critical Perspectives on Business and Management*, 2(2), 334.
- Sharpe, J.P., Martin, N.R. and Roth, K.A. (2011). Optimism and the Big Five factors of personality: Beyond neuroticism. *Personality and Individual Differences*, 51, 946-951.

- Stinchcombe, A. L. (1965). Organizations and social structure. *Handbook of organizations*, 44(2), 142-193.
- Sweeny, K., Carroll, P. J., & Shepperd, J. A. (2006). Is optimism always best? Future outlooks and preparedness. *Current directions in psychological science*, 15(6), 302-306.
- Tang, J., & Murphy, P. J. (2012). Prior knowledge and new product and service introductions by entrepreneurial firms: the mediating role of technological innovation. *Journal of Small Business Management*, 50(1), 41-62.
- Taylor, S. and Brown, J.D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin*, 103, 193-210.
- Tyler, B. B., & Caner, T. (2016). New product introductions below aspirations, slack and R&D alliances: A behavioral perspective. *Strategic Management Journal*, 37(5), 896-910.
- Ucbasaran, D., Westhead, P. Wright, M. and Flores, M. (2010). The nature of entrepreneurial experience, business failure and comparative optimism. *Journal of Business Venturing*, 25, 541-555.
- Ucbasaran, D., Flores, M. and Westhead, P. (2007). Entrepreneurial optimism and experience: Does the nature of experience matter? *Frontiers of Entrepreneurship Research*, 27 (6), Article 4. Available at <http://digitalknowledgebabson.edu/fer/vol27/iss6/4>
- Wennberg, K., Delmar, F., & McKelvie, A. (2016). Variable risk preferences in new firm growth and survival. *Journal of Business Venturing*, 31(4), 408-427.
- Williams, D.G. (1992) Dispositional optimism, neuroticism, and extraversion. *Personality and Individual Differences*, 13 (4), 475-477.
- Youssef, C. M., & Luthans, F. (2007). Positive organizational behavior in the workplace: The impact of hope, optimism, and resilience. *Journal of management*, 33(5), 774-800.
- Zhang, Y. 2006. The presence of a separate COO/president and its impact on strategic change and CEO dismissal. *Strategic Management Journal*, 27 (3), 283-300.

Table 1: Variable Definitions

VARIABLE	ABBREVIATION of VARIABLES	DEFINITION
New Product Introductions	New Product	(1) Dummy =1 if the firm introduced at least one product each year between 2008 and 2011, 0 otherwise.
	No of Product (Robustness)	(2) Number of products introduced each year between 2008 and 2011.
Past Performance Relative Aspirations	Performance Feedback	Dummy =1, if the business met or exceeded the primary founder's expectations for growth between when the business started (2004) and 2008, 0 otherwise.
Founder Optimism	Optimism	(1) 5-point scale item to the question in 2008 "In uncertain times, I usually expect the best."
	Optimist (Robustness)	(2) Dummy =1 if founder answered 4 or 5, 0 otherwise.
Gender of the Primary Founder	Female	Dummy =1 if founder is female, 0 otherwise.
Age of the Primary Founder	Age	Age of the founder
Education of the Primary Founder	Education	Dummy = 1 if education is Bachelor's Degree or more, 0 otherwise.
Number of Hours Worked	Hours Worked	Number of hours in an average week primary founder spend working at the new venture.
Number of Owners	Number of Owners	Total number of owners of the business.
Total Employees	Total Employees	Total number of Employees (log).
Total Assets	Total Assets	Total Assets \$ (log).
Technology Generating Industry	Technology Generating	Dummy=1 if firm is operating in a technology generating industry, 0 otherwise.
	2- Digit SIC Dummies (Robustness)	28: Chemicals and allied products 35: Industrial machinery and equipment 36: Electrical and electronic equipment 38: Instruments and related products

Table 2: Percentage of new product introductions by performance feedback and founder optimism

Performance Feedback	Founder Optimism	Obs.	% of new ventures introducing at least one new product between 2008 and 2011.
Performance Below Aspirations	Optimistic Founders	N=100	61%
	Unoptimistic Founders	N=72	38%
Performance Above Aspirations	Optimistic Founders	N=110	52%
	Unoptimistic Founders	N=62	55%
Total		N=344	52 %

Table 3: Descriptive Statistics and Pairwise Correlations

Variables	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12
1 New Product	0.52	0.50	1											
2 Performance Feedback	0.48	0.50	0.02	1										
3 Optimism	2.3	1.20	0.13*	0.05	1									
4 Female	0.15	0.35	-0.04	-0.06	0.12*	0.10	1							
5 Age	51.2	9.6	-0.09	-0.06	-0.03	-0.01	0.02	1						
6 Education	0.51	0.50	0.14*	-	0.08	0.04	-0.03	0.06	1					
7 Hours Worked	44.5	20.7	0.26*	0.13*	0.04	0.06	-0.09	-0.09	-0.08	1				
8 Number of Owners	4.41	12.9	0.18*	-	0.11*	0.10*	0.00	-0.04	0.20*	0.14*	1			
9 Total Employees (log)	1.29	1.17	0.21*	0.12*	0.09	0.14*	-0.09	-	0.11*	0.37*	0.25*	1		
10 Total Assets (log)	6.26	6.07	0.11*	0.23*	0.01	0.05	-0.07	0.06	0.05	0.39*	0.23*	0.55*	1	
11 Technology Generating	0.13	0.34	0.14*	-0.07	0.03	0.04	-0.02	0.08	0.19*	0.00	0.05	0.00	0.08*	1

Table 4: Comparison of Revenue Data with Performance Feedback Variable

Correlations	Performance Feedback	
Revenue 2004	0.1545	
Revenue 2005	0.1535	
Revenue 2006	0.1941	
Revenue 2007	0.1488	
	Sample t-test (increase in revenue)	
	Performance Same or Above Aspirations	Performance Below Aspirations
Mean	2.21	1.89
Std. deviation	(0.106)	(0.094)
Observations	58	64
Difference	-0.32	
Std. deviation	(0.142)	
t	-2.2253	
p-value	0.0279	

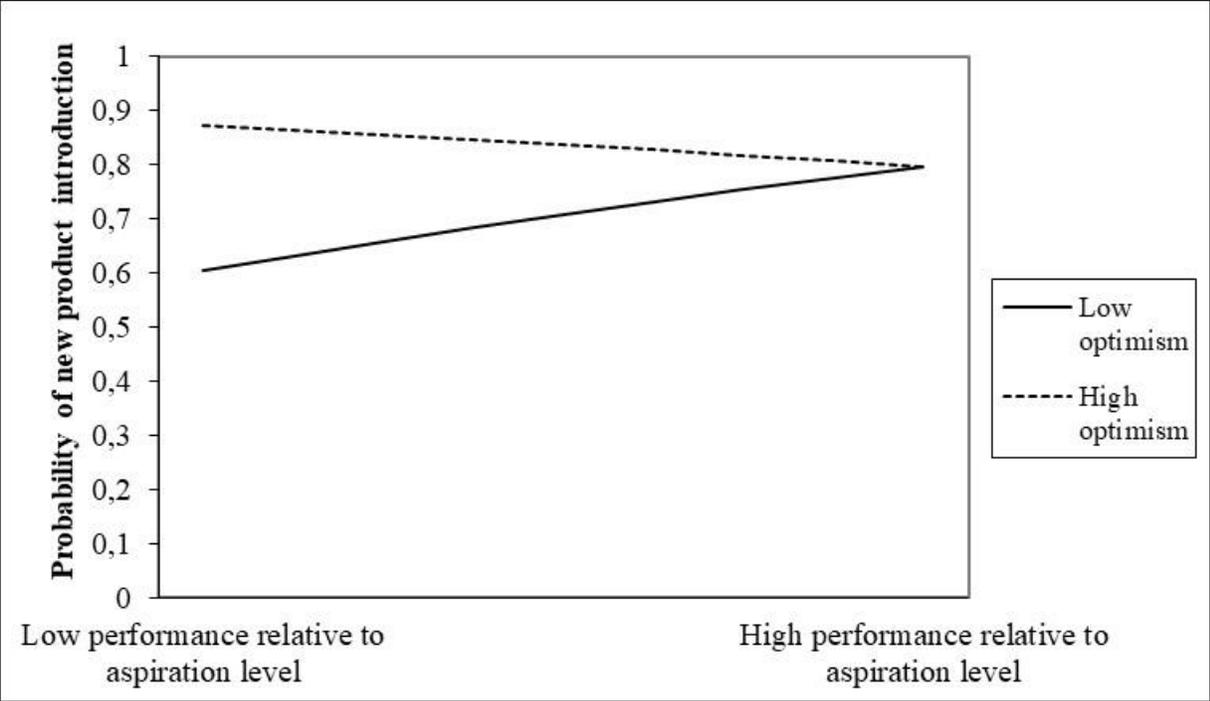
Table 5: Test of Hypothesis 1: Logit estimations of the effect of performance feedback on new product introductions

Dependent variable: New product introductions				
Model	(1)	(2)	(3)	(4)
Aspiration	0.070 (0.216)	-0.005 (0.247)	-0.145 (0.161)	-0.160 (0.347)
Woman owner		0.043 (0.375)	0.021 (0.246)	-0.049 (0.486)
Age of owner		-0.103 (0.087)	-0.010 (0.057)	0.012 (0.115)
Age of owner squared		0.001 (0.001)	0.0001 (0.001)	0.0001 (0.001)
College grad. Owner		0.436 (0.244)	0.684 (0.165)	1.007 (0.350)
Hours worked		0.023 (0.007)	0.022 (0.004)	0.028 (0.008)
Number of employees		0.097 (0.138)	0.179 (0.086)	0.285 (0.158)
Assets		0.025 (0.059)	-0.004 (0.039)	0.022 (0.073)
Number of owners		0.074 (0.052)	0.001 (0.006)	0.009 (0.013)
Tech. generator		0.554 (0.332)	0.633 (0.198)	1.066 (0.451)
Year 2010			-0.057 (0.187)	-0.145 (0.252)
Year 2011			-0.202 (0.188)	-0.447 (0.256)
Constant	0.047 (0.152)	1.115 (2.221)	-2.039 (1.451)	-3.561 (2.954)
Pseudo R2	0.0002	0.113	0.074	
Log likelihood	-238.11	-206.68	-506.23	-459.72
Number of groups				327
Average obs per group				2.6
N	344	332	848	848

Table 6: Test of Hypothesis 2: Logit estimations of the interaction effect of performance feedback and founder optimism on new product introductions

Dependent variable: New product introductions						
Model	(1)	(2)	(3)	(4)	(5)	(6)
Optimism	0.230 (0.093)	0.229 (0.094)	0.433 (0.132)	0.187 (0.098)	0.189 (0.098)	0.364 (0.142)
Aspiration		0.031 (0.218)	1.667 (0.745)		-0.053 (0.248)	1.294 (0.778)
Optimism x Aspiration			-0.441 (0.192)			-0.368 (0.201)
Woman owner				-0.038 (0.375)	-0.043 (0.375)	-0.027 (0.379)
Age of owner				-0.104 (0.068)	-0.103 (0.087)	-0.119 (0.086)
Age of owner squared				0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
College grad. Owner				0.426 (0.245)	0.420 (0.247)	0.373 (0.249)
Hours worked				0.023 (0.007)	0.023 (0.007)	0.024 (0.007)
Number of employees				0.078 (0.138)	0.080 (0.138)	0.064 (0.137)
Assets				0.031 (0.058)	0.033 (0.058)	0.044 (0.058)
Number of owners				0.066 (0.047)	0.065 (0.047)	0.061 (0.045)
Tech. generator				0.541 (0.334)	0.540 (0.334)	0.549 (0.337)
Constant	-0.771 (0.362)	-0.783 (0.372)	-1.520 (0.508)	0.394 (2.236)	0.374 (2.231)	0.082 (2.212)
Pseudo R2	0.013	0.013	0.025	0.109	0.109	0.115
Log likelihood	-235.05	-235.04	-232.37	-205.02	-204.99	-203.45
Number of groups						
Average obs per group						
N	344	344	344	332	332	332

Figure 1: Test of hypothesis 2: Logistic regression on the interaction effect of performance feedback and founder optimism on new product introductions



Appendix: Robustness Checks

As robustness checks, we performed an extensive set of tests, both for Hypotheses 1 & 2.

Robustness for Hypothesis 1a and 1b:

Different Specifications for New Product Introductions. We employed the number of new products after 2008 as our dependent variable and re-estimated the specification in column 2 in Table 4. Since our dependent variable now can take 0, 1, 2 and 3 as outcomes, we switched to a multinomial logit specification. The estimated coefficients for the aspiration measure now are interpreted as the effect of past performance relative to aspirations for introducing 1, 2 or 3 products relative to 0 products respectively over the next three years. The coefficients are 0.14 (t-stat = 0.46), -0.54 (t-stat = 1.54), 0.39 (t-stat = 1.04) for choices of introducing 1, 2 or 3 products. Neither of the coefficients are significant at the conventional levels of significance. Therefore, the performance feedback measure remains insignificant in this specification as well.

New Ventures with Single Founders. As a robustness check, we also restricted our attention to single founder firms and re-estimated the specification in column 2 in Table 4. The rationale for this restricted sample exercise will be more clear in testing Hypothesis 2 and will be discussed below. The coefficient of our main variable, performance feedback measure remains still insignificant (t-stats = 0.84) in this subsample of firms.

Next, we estimated our equation with the dependent variable, which can take 0, 1, 2 and 3 as outcomes in the restricted sample of single-owned firms. The coefficients estimates are 0.39 (t-stat = 0.86), -0.28 (t-stat = 0.55), 1.36 (t-stat = 1.76) for choices of introducing 1, 2 or 3 products. The coefficients for the aspiration measure in introducing 1 or 2 products are not significantly different than the base case of introducing 0 at the conventional levels of significance. However, the effect of past performance relative to aspirations for introducing 3 products relative to not introducing any is significant at %8 (not significant at $p=0.05$). This group of entrepreneurs who introduce 3 products can be different than the rest of the other groups in some other ways. One major difference we found from the estimated equation is that the effect of college education is significant only in introducing 3 products relative to 0

products. We investigate this further in testing Hypothesis 2 since the coefficient of aspiration measure still is non-significant (significant at $p=0.08$) with this specification as well.

Alternative Measures for New Product Introductions. In this robustness check, we used new process introductions and a measure that counts both product and process introductions as our dependent variables to check the validity of the results with these alternative measures. With the new process introductions measure, the estimated coefficient is non-significant (-0.168, $t\text{-stat} = 0.66$). When we used this dependent variable as 0, 1, 2 and 3 possible process introductions and estimated a multinomial logit specification, the coefficients are 0.05 ($t\text{-stat} = 0.18$), -0.51 ($t\text{-stat} = 1.21$), -0.48 ($t\text{-stat} = 0.87$), for choices of introducing 1, 2 or 3 processes. Neither of the coefficients are significant at the conventional levels of significance. Therefore, the effect of performance feedback on alternative risky actions remains non-significant in this specification as well.

For the restricted sample of single founder firms, the coefficient of our main variable is still insignificant (0.18, $t\text{-stats} = 0.45$). Finally, we estimated our equation with the dependent variable, which can take 0, 1, 2 and 3 as outcomes in the restricted sample of single-founder firms. The coefficients estimates are 0.37 ($t\text{-stat} = 0.79$), 0.37 ($t\text{-stat} = 0.54$), -0.62 ($t\text{-stat} = 0.68$) for choices of introducing 1, 2 or 3 products. The coefficients for the performance feedback measure in introducing neither products are not significantly different than the base case of introducing 0 products at the conventional levels of significance.

We repeated the above analysis for the measure that counts both product and process introductions. The estimated coefficient is again insignificant (0.105, $t\text{-stat} = 0.42$). Next, the dependent variable is 0, 1, 2, 3, 4, 5 and 6 possible process and product introductions, and the coefficients from the multinomial logit estimation for this specification are 0.36 ($t\text{-stat} = 1.05$), -0.08 ($t\text{-stat} = 0.21$), 0.39 ($t\text{-stat} = 0.97$), -0.55 ($t\text{-stat} = 1.10$), 0.09 ($t\text{-stat} = 0.15$), -0.50 ($t\text{-stat} = 0.72$) for choices of introducing 1, 2, 3, 4, 5 and 6 processes respectively. Neither of the coefficients are significant at the conventional levels of significance. Therefore, the performance feedback measure remains non-significant in this specification as well. If we restrict our sample to single founder firms, the coefficient of our main variable is still non-

significant (0.25, t-stats = 0.69). Finally, we estimated our equation with the dependent variable, which can take 0, 1, 2, 3, 4, 5 and 6 as outcomes in the restricted sample of single-owned firms. The coefficients estimates are 0.06 (t-stat = 0.13), 0.17 (t-stat = 0.32), 1.06 (t-stat = 1.46), -0.10 (t-stat = 0.09), 0.41 (t-stat = 0.50), -0.08 (t-stat = 0.05) for choices of introducing 1, 2, 3, 4, 5 and 6 products. The coefficients for the aspiration measure in introducing neither number of products and/or processes are not significantly different than the base case of introducing 0 at the conventional levels of significance.

To sum up, with the robustness checks we employed, we conclude that past performance relative to aspirations does not have a significant main effect on new product introductions in new ventures, which suggests Hypotheses 1a and 1b are not supported.

Robustness for Hypothesis 2

Different Specifications for Founder Optimism. We conducted an extensive set of robustness analysis to test the validity of Hypothesis 2. First, we estimated the main specification in column 6 in Table 5 using a discrete version of the optimism variable. As explained before, the measure is coded 1 if the main owner is optimistic and 0 otherwise. With this specification, we found that while entrepreneurial optimism has no significant effect on new product introductions in high performing new ventures (0.730 - 0.922, with F-test with p-value = 0.57), it significantly increases new product introductions in low performing firms with a coefficient 0.730 and t-stat= 2.04, p =0.040. We estimate the pooled logit and random effects logit models using the specification in column 6 in Table 4 with the 5 points scale as in the original table. When estimated via maximum likelihood, the pooled logit results with N= 848, basically produces the same directions for the main effects and the interaction term. This specification controls for the year effects on top the same set of controls used in the estimation in Table 5. This supports that entrepreneurial optimism significantly increases new product introductions in low performing firms with a coefficient 0.331 and t-stat= 3.26, p =0.001. Similar conclusion is reached when we estimated the random effects logit model. This specification controls for the firm level unobserved heterogeneity as in Audia and Greve (2006). We again find that entrepreneurial optimism significantly increases new product introductions in low performing firms with a coefficient 0.589 and t-stat= 2.88, p =0.004. If instead, we use the discrete

measure of optimism in the pooled logit case, the corresponding F-test for the coefficient difference $0.618 - 0.470$ has a p-value of 0.50, and the optimism coefficient is significant with a coefficient value of 0.618 and t-value of 2.60 ($p = 0.009$). Discrete optimism variable in the random effects logit model produces the same conclusion; F-test for the coefficient difference $1.151 - 1.135$ has a p-value of 0.97, and the optimism coefficient is significant with a coefficient value of 1.151 and t-value of 2.28 ($p = 0.02$).

New Ventures with Single Founders. Similar results are obtained in the restricted sample of single founder new ventures. As mentioned in the robustness analysis for Hypothesis 1, the usage of restricted sample in testing the hypotheses is for the following idea. The optimism question from which we construct our optimism measure is asked to the primary founder of the company in our dataset. Therefore, one might want to ensure the validity of the results in the single-founder firms, since founder optimism might be reflected to the company's decisions more directly in single founder new ventures. When estimated via maximum likelihood, the restricted sample results with $N = 158$, basically produces the same directions for the main effects and the interaction term. We found support that entrepreneurial optimism significantly increases new product introductions in low performing firms with a coefficient 0.558 and t-stat= 2.14, $p = 0.030$. When we repeated the analysis with the discrete measure of optimism, similar conclusion is reached; that entrepreneurial optimism has a significant effect in low performing firms (1.21 with t-stat= 2.17, $p = 0.030$).

Alternative Measures for New Product Introductions. In this robustness check, we used new process introductions and the measure that counts both product and process introductions as our dependent variables to check the validity of the results with these new measures as we did previously for Hypotheses 1a and 1b. With the new process measure, we found that entrepreneurial optimism increases new process introductions in low performing firms with a coefficient 0.174 and t-stat= 1.15, $p = 0.24$. The corresponding F-test has a p-value of 0.17 if we use the discrete measure of optimism instead. If we restrict our sample to single person owned firms, the overall significance of the single coefficients decreases, possibly due to the lower sample size of $N = 158$, and the fact that processes might not be as good as a proxy for the entrepreneurial activity as the product introductions. However, the directions of

the effects remain same. One interesting finding in the single owner firms is the effect of hours worked by the owner. This variable basically explains half of the total variation by itself and this among other things may mean the dependence of the future success of the firm on the founder's effort, especially when the concern is about developing new processes.

We repeated the analysis for the measure that counts both product and process introductions. With the composite measure, we found that founder optimism increases new product/process introductions in low performing firms with a coefficient 0.344 and t-stat= 2.38, p =0.017. The corresponding F-test has a p-value of 0.93 if we use the discrete measure of optimism instead, and we found that it increases new product/process introductions in low performing firms with a coefficient 0.741 and t-stat= 1.99, p =0.04. If we restrict our sample to single person owned firms, the overall significance of the single coefficients decreases, but the directions of the effects remain same. Thus, entrepreneurial optimism has significant effect in increasing new product/process introductions in low performing firms with a coefficient 0.487 and t-stat= 2.07, p =0.03. Similar conclusion is reached when we estimated using the discrete measure of optimism. The corresponding F-test has a p-value of 0.54 (testing 1.071 – 0.762) meaning entrepreneurial optimism increases new product/process introductions in low performing firms with a coefficient 1.07 and t-stat= 1.96, p =0.05.

To sum up, with the robustness checks we employed, we conclude that entrepreneurial optimism has a significant effect on new product introductions in high performing new ventures.