Socioemotional Wealth as a Mixed Gamble: Revisiting Family Firm R&D Investments with the Behavioral Agency Model

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Theoretical explanations for family firm under-investment in R&D relative to non-family firms remain nascent. We revisit this question using a refinement to the behavioral agency model (BAM) – the mixed gamble – that allows us to examine the socioemotional trade-offs that R&D represents for the family firm and how this differentiates their R&D investment decision from non-family firms. We do so in an empirical context where R&D investment is of greatest importance – high technology industries. Moreover, we examine three contingencies that allow us to explore heterogeneity across family firms in their R&D decisions due to their effect upon the family’s socioemotional wealth mixed gamble: institutional investor ownership, related diversification, and performance hazard.
Empirical research has consistently revealed that family firms tend to under-invest in R&D relative to non-family firms (Block, 2012; Chrisman & Patel, 2012; Muñoz-Bullon & Sanchez-Bueno, 2011). This presents a theoretical challenge, given that family owners are argued to have longer-term orientations than non-family principals (Sirmon & Hitt, 2003); thus, why would they neglect R&D investments that reportedly lead to long-run advantages through enabling strategic adaptation in rapidly changing markets (García-Manjón & Romero-Merino, 2012; Teece, Pisano, & Shuen, 1997)? This question is particularly salient in settings where R&D investment is an inevitable necessity, such as in high technology industries. Moreover, a recent review suggests that the question of whether family firms are more or less innovative than non-family firms is far from settled (see De Massis, Frattini, & Lichtenthaler, 2013). Our study revisits the family firm’s R&D investment decision in a high technology empirical setting using the behavioral agency model (BAM) and the concept of mixed gambles – those gambles that have the potential for gain and loss outcomes (Martin, Gomez-Mejia, & Wiseman, 2013). We do so by analyzing a specific mixed gamble – the family’s balancing of potential socioemotional gains and losses associated with R&D investment.

The notion of trade-offs in family firm decision-making has previously been implicit in this literature, as scholars have suggested that family owners will trade off economic and non-economic objectives when making decisions including R&D investments (Chrisman & Patel, 2012), environmental strategy (Berrone, Cruz, Gomez-Mejia, & Larraza-Kintana, 2010), and diversification strategy (Gomez-Mejia, Makri, & Larraza-Kintana, 2010), among others. Common assumptions in this research stream have been that: (1) while family firms will not completely neglect the economic consequences of their decisions, the non-economic consequences are often likely to pre-dominate (e.g., Berrone et al., 2010; Gomez-Mejia et al.,
and (2) the family’s decision is motivated by loss aversion with regard to its stock of socioemotional wealth (SEW). We re-assess these assumptions by arguing that decisions involving trade-offs will require the family to weigh potential socioemotional gains against potential losses stemming from R&D, which requires a holistic assessment of the socioemotional consequences. This approach brings into question the assumption that non-economic consequences will pre-dominate, if for instance the negative economic effect associated with potential loss outcomes has dire consequences for family SEW.

Our focus on high technology firms to examine family firm R&D investments is also new to this research stream. The importance of R&D to these industries suggests that under-investment is likely to create the potential for greater downside risk to the firm than in less technologically oriented industries, implying that R&D investment may in fact reduce firm risk. This challenges the pre-existing paradigm in family firm research suggesting that higher levels of R&D are perceived by the family firm as increasing the firm’s risk profile [for example, Chrisman and Patel (2012) argue that family firms perceive R&D as risk-increasing in the short-term]. In fact, there is broad consensus that R&D reduces long-term financial risks for high technology firms; yet, there is also evidence to suggest that the outcomes of R&D investment in this sector are uncertain (Ahuja, Lampert, & Tandon, 2008). Said differently, the potential gains and losses from R&D investment are amplified in a high technology setting, thus increasing the salience of the mixed gamble scenario confronting family firms. As such, this makes the high technology empirical setting ideal for examining the family’s socioemotional mixed gamble— the consideration of the possible socioemotional gains and losses – when making R&D decisions, and a more stringent test of the hypothesis that family firms under-invest in R&D.

We also examine theoretical boundary conditions, extending our understanding of how
family firms may differ in their estimations of the potential socioemotional gains and losses associated with R&D decisions. Specifically, we concentrate on three key moderators: institutional investor ownership, related diversification, and the firm’s performance hazard. By doing so, we respond to the recent call for taking into account contextual factors that explain heterogeneity within family firms (De Massis et al., 2013). Together, these moderators cover the key dimensions of corporate governance, corporate strategy, and firm performance, all of which are of great interest to strategic management scholars. The study of institutional investor influence on firm decision-making has been ubiquitous in agency research, largely due to their growing prominence in the corporate governance arena as well as their activism (Dalton, Daily, Certo, & Roengpitya, 2003; Useem, 1996). In particular, concentrated ownership provides institutional investors greater control over the firm, making their influence important to the study of family firm governance and decision making. Related diversification is of great interest to corporate strategy as it provides an answer to the fundamental decision regarding which businesses the firm should compete in and how synergies can be derived from multiple business units (cf. Hofer & Schendel, 1978). It has also emerged as a key construct in technology management studies suggesting that related product diversification can stimulate the creation of new technological knowledge (Sugheir, Phan & Hasan, 2012). Finally, recent research shows that family firms increase their R&D investments when their performance falls below that of competitors (Chrisman & Patel, 2012); we follow up on this finding by arguing that this performance shortfall – termed performance hazard – amplifies the effects of institutional investor ownership and related diversification in the context of family firm investment, which leads to novel insights.

We provide several contributions to the study of family firm decision-making and R&D
investment. First, this study elucidates the mixed gamble confronting family firms when making strategic decisions such as R&D investments. Our theory and findings suggest that family owners will be cognizant of the short and long-term costs and benefits when making such decisions. As noted above, the vast majority of recent family firm studies predicted that family firms will act to preserve family SEW, suggesting they are only cognizant of potential SEW losses. Our framework extends those arguments by suggesting that family firms may also be motivated by potential gains, or the potential to further grow the existing stock of socioemotional wealth. Second, we demonstrate the instrumental role of three factors in influencing the firm’s mixed gamble (or trade-offs) with regard to family SEW in the R&D investment decision: the presence of institutional investors, the extent of related diversification, and current performance hazard. Third, we examine family firm R&D decisions in high technology industries – an empirical context not previously utilized in this stream of research (cf. De Massis et al., 2013). Finally, we contribute to research examining agency problems—in particular, those due to principal–principal conflict—within family firms, given that the non-economic utility that leads to differences between family and non-family investment behaviors is also likely to create tension between family and non-family owners.

THEORY & HYPOTHESES

Family Agency and Socioemotional Wealth

Agency issues in many publicly traded firms include a long-overlooked element: family control. Drawing on traditional agency research that suggests risk bearing created by over-investment in a firm leads to risk aversion, family firm research suggests that family owners will be more risk averse than their non-family counterparts due to the fact that the family principals are more likely to have their wealth concentrated in the firm (Basu, Dimitrova, & Paeglis, 2009;
McConaughy, Mathews, & Fialko, 2001; Mishra & McConaughy, 1999). However, empirical research examining strategic risk taking by family owners has not provided convincing support for this perspective, suggesting that traditional agency logic may not adequately explain family decision-making under risk (Gomez-Mejia et al., 2011). In order to advance our understanding of risk within the family firm literature, it was necessary to add two theoretical perspectives to the agency theory approach: (1) behavioral decision research, as incorporated in the BAM (Wiseman & Gomez-Mejia, 1998); (2) the influence of non-economic forms of utility, as represented by socioemotional forms of wealth (Gomez-Mejia et al., 2007).

The BAM draws upon behavioral decision making research to incorporate the effects of problem framing, loss aversion, and risk bearing into predictions of agent risk taking. The concepts of loss aversion and risk bearing in particular have been embraced by family firm research when utilizing the BAM. According to the BAM, the larger the value of wealth-at-risk of loss (or risk bearing) of the agent, the more risk averse the agent will be. Using this theoretical base, family firm research has examined the effect of risk bearing created by non-traditional forms of wealth, namely SEW (Berrone et al., 2010; Gomez-Mejia et al., 2007; 2010). SEW represents affective wealth-at-risk, or risk bearing for the family owners, which according to the BAM is negatively related to risk taking. SEW is a broad construct that has been associated with the unrestricted exercise of personal authority vested in family members (Jones, Makri, & Gomez-Mejia, 2008; Schulze, Lubatkin, & Dino, 2003), the enjoyment of family influence over the business (Gomez-Mejia et al., 2007), and identification with the firm (Dyer & Whetten, 2006). The concept of family firm loss aversion with regard to the family’s stock of SEW (that is, the motivation to preserve SEW) has been used to predict various family firm decisions. For instance, family firms—avoiding SEW losses—are less likely to join an industry cooperative due
to loss of control (Gomez-Mejia et al., 2007), undertake corporate diversification (Gomez-Mejia et al., 2010), or engage in polluting activities (Berrone et al., 2010). We now extend the SEW theoretical framework and the BAM’s concept of loss aversion to examining the mixed gamble for family firms in their decision to invest in R&D in high-technology industries.

**R&D Investments and Mixed Gambles**

As noted above, the BAM’s framework has been utilized in family firm research to describe how loss aversion with regard to family SEW leads to less risk taking. A refinement to this framework has integrated the concept of mixed gambles in order to enhance its predictions. The mixed gamble is one with the possibility of gain and loss outcomes (c.f. Bromiley, 2009). In the context of strategic decision-making, it is very rare that any decision will not have a range of outcomes that include the potential for both gains and losses (Bromiley, 2009). The result is that decision makers are likely to be aware of the potential gain and loss outcomes when making decisions under risk, such as the decision to invest in R&D.

The mixed gamble approach to predicting decisions under risk provides a substantially different approach compared to the behavioral theory of the firm (BTOF; Cyert & March, 1963) and its use of aspiration levels (subjectively determined by decision makers) to determine risk preferences. According to BTOF, greater risk will be taken if expected outcomes are below some target level of performance and vice versa. However, the mixed gamble logic suggests that the decision is not due to expected performance relative to target but rather due to the weighing of potential gains and losses. The utility of the mixed gamble in predicting agent risk taking was demonstrated in the context of the behavioral agency model (BAM) by Martin and colleagues (2013), who argued that CEOs are likely to weigh the potential gains (or prospective wealth) in their equity-based compensation, against the potential losses (risk bearing) when making
strategic decisions that could influence the value of said equity. That is, the CEOs are likely to be cognizant of the potential for further gains in their wealth when making strategic decisions under risk, which incentivizes them to take more risk, attenuating loss aversion, or the negative effect of risk bearing upon risk taking. We argue that this logic also has utility when applied to the strategic decision confronting family firms with regard to R&D investments. This approach departs from prior family firm decision-making literature in two important ways. First, it moves beyond the idea that the family owners will be cognizant of only potential socioemotional losses when making decisions under risk. Second and relatedly, it suggests that the family will attempt to estimate possible socioemotional gains when making such decisions, in order to consider whether it is worth risking the prospective socioemotional losses.

Drawing upon the prediction that family owners will be loss averse with respect to SEW, various studies have found that family firms tend to under-invest in R&D relative to non-family firms (Chrisman & Patel, 2012; Muñoz-Bullon & Sanchez-Bueno, 2011). This has been explained using the logic that R&D spending is associated with threats to family control, and thus SEW (Chrisman & Patel, 2012), as well as increased financial risks as a result of the uncertain payoffs associated with higher R&D spending (Chrisman & Patel, 2012; Muñoz-Bullon & Sanchez-Bueno, 2011). These studies focused solely upon the potential SEW or financial losses, without considering the potential SEW gains that the family owners could foresee due to successful R&D. That is, prior family firm R&D research has not considered the possibility that the R&D decision is often a mixed gamble: one with the potential to create both gain and loss outcomes.

Investment in R&D can lead to various benefits, given the significance of successful innovation – the result of R&D projects – to a firm’s ability to compete and ultimately survive
(Ahuja et al., 2008; Bushee, 1998; Nelson & Winter, 1982; Palmer & Wiseman, 1999; Sundaram, John, & John, 1996). The importance of successful R&D is even greater in high technology sectors, given that they are typified by rapid technological change. A key factor to success in such settings is firm ability to dynamically adapt to rapidly changing environments (Teece et al., 1997). A firm’s dynamic capabilities and a successful R&D capability are mutually reinforcing, implying that R&D investment is crucial to the long-term survival of the firm in these high technology environments. Thus, a potential benefit of R&D for the family owners is enhanced dynamic capabilities and resilience to rapidly changing external environments. Ultimately, these capabilities are important in avoiding the catastrophic SEW loss that is associated with family firm failure (Gomez-Mejia et al., 2007). However, in the best case scenario, successful R&D investment could in fact enhance the family owners’ standing and reputation – and thus SEW – due to outperforming peers. That is, economic success due to successful R&D investment is likely to translate into socioemotional benefits for the family. This possibility has not been explicitly integrated into extant theories of family firm decision-making.

**R&D Mixed Gamble for Family versus Non-Family Owners.** When comparing the R&D decisions of family and non-family owners, we argue that both groups are likely to view R&D investment as a mixed gamble, given that the complexity and uncertainty associated with R&D generates a range of possible outcomes that span the negative and the positive. However, as summarized in Figure 1, a key difference between mixed gambles for family and non-family firms is the importance of SEW to the former. While there is uncertainty regarding the financial pay-offs due to R&D investment for family and non-family owners alike, the family firm faces unique socioemotional trade-offs that other firms do not. First, they face a *certain loss* that the non-family firm does not: the SEW loss due to diluted family influence that flows from the use
of external expertise and capital in the R&D process (Chrisman & Patel, 2012). Given the significant investments and technological expertise that are likely to be associated with R&D investments in high technology industries, this loss of control is likely to be amplified in this setting. Thus, family owners associate R&D investment with a certain SEW loss that is likely to impact their mixed gamble when making R&D decisions. As noted above, the family may also anticipate potential SEW gains if R&D is successful, however these gains are probable (and may be highly speculative), while the loss of SEW due to diluted influence is certain. It follows that the family firm calculus when weighing potential losses against gains will include a loss that the non-family firm does not incur, and that is not likely to be outweighed by potential SEW gains. According to the logic of mixed gambles, a larger potential SEW loss relative to SEW gain shifts the family firm decision in favor of investing less in R&D relative to non-family firms.

*** Insert Figure 1 about here ***

While prior research has shown a negative impact of family ownership on R&D investment (Chrisman & Patel, 2012), the high technology setting provides a more stringent context to test the influence of SEW upon family firm decision-making with regard to R&D. Failure to successfully invest in R&D within dynamic, rapidly changing market environments as in high technology can lead to failure to develop the capabilities necessary to survive in such environments (Teece et al., 1997). For the family principals, despite the obvious potential benefits of R&D—including enhanced survival prospects—that they share with non-family firms in high technology industries, increased R&D also reduces the family principals’ SEW through loss of control, affecting the family firm’s mixed gamble and leading to the observed under-investment. Therefore, we expect that even in a high technology setting family firms will under-invest in R&D relative to non-family firms. Hence, our baseline hypothesis extends prior
research (Chrisman & Patel, 2012) by explicitly focusing on how family firms respond to the mixed gamble concerning the R&D decision in a context where R&D is considered a lower risk alternative from a competitive standpoint. Thus:

**Hypothesis 1:** Family firms are less prone to invest in R&D compared to non-family firms even in high technology sectors, where such investments mitigate business risk.

The first hypothesis focused on differences between family and non-family controlled firms (between-group variance). We now shift our focus to explaining differences among family firms (within-group heterogeneity). Below, we examine boundary conditions by focusing on important constructs in the context of high technology firms and R&D investments. These constructs correspond to the key dimensions of corporate governance, corporate strategy, and firm performance. Our theoretical logic is summarized in Figure 2 and described in detail below.

*** Insert Figure 2 about here ***

**Moderators in the R&D Mixed Gamble**

*Institutional Investors.* Institutional investors have grown in size and become increasingly dominant in corporate board rooms over recent decades (Gillan & Starks, 2000; Useem, 1996). According to agency theory, concentrated owners such as institutional investors represent more active monitors in comparison to diffuse owners (Jensen & Meckling, 1976). Yet, little is known about how they influence family firm decision-making. When ownership is shared among different groups (principals) and when objectives vary across these ownership groups, some degree of compromise among principals is likely. The degree of compromise will depend upon how active or passive the principals are relative to the other group(s) and the degree of to which the goals of the principals are conflicting as opposed to complementing (Villanueva & Sapienza, 2009). The activist role of institutional investors has been well documented (e.g., Nesbitt, 1994; Smith, 1996; Useem, 1996). This research has shown that the activist efforts of institutional
investors are likely to gain substantially more support than the same efforts of individual investors (Gillan & Starks, 2000). Reasons for this include a coordinated approach to activism by institutional investors (Gillan & Starks, 2000), an emphasis on enhancing returns (Thomsen & Pedersen 2000), and an active interest in the management practices of the firms in which these institutions invest (Bushee, 1998; Graves & Waddock, 1990; Johnson & Greening, 1999). Institutional investor ownership has also been positively associated with R&D investments, given the apparent relationship of R&D with increased probability of enhanced earnings (Bushee, 1998). This positive link between R&D and earnings is likely to be especially pronounced in high technology firms (Teece et al., 1997). Thus, institutional investors are likely to oppose the aforementioned tendency of family firms to under-invest in R&D due to their different utilities, suggesting that their goals are unlikely to complement those of the family owners on this particular dimension (Villanueva & Sapienza, 2009).

Conflict with non-family stakeholders is often perceived by the family owners as detrimental to the family’s accumulation of SEW, given that said conflict can lead to damaged reputation and image (Berrone et al., 2010). It follows that disagreement with institutional investors could be associated with SEW losses for the family. Thus, the family firm is likely to be cognizant of these potential losses when making decisions with regard to R&D. Put differently, under-investing is likely to lead to greater SEW losses in the presence of institutional ownership due to the anticipated conflict and relationship damage. Further, the institutional investors’ emphasis upon returns is likely to increase the weighting given to the potential gains to the family firm from R&D in the mixed gamble, given pursuit of financial returns for which institutional investors are motivated to achieve (Gillan & Starks, 2000). In high technology firms, the institutional investor will be very aware of the importance of R&D to achieving or
maintaining competitive advantage (Hoskisson, Hitt, Johnson, & Grossman, 2002), making them even more sensitive to the necessity of gains from R&D and the potential negative effects of under-investment in this important function. These anticipated performance gains are likely to translate into SEW gains for the family, given that successful R&D is likely to be associated with positive publicity for the firm that can enhance the family’s reputation. Importantly, however, regardless of the eventual outcome of R&D projects, cooperation and acquiescing to institutional investors’ wishes through greater R&D spending might substantially enhance—or at a minimum protect—SEW because cooperation along these lines is likely to build social capital with institutions. Improved family reputation with such investors and enhanced social capital among the institutional investors’ representatives on the board will likely reduce the propensity of such investors to attempt to limit the family’s control (e.g., when appointing family members to key positions). Conversely, acting out of line with institutional investors’ wishes may make them more likely to pressure the family to curb its influence. Thus, for firms where institutional ownership is high, greater R&D spending is associated with certain SEW gains for the family.

Taken together, these arguments suggest that institutional investors are likely to alter the weighting in the family firm’s mixed gamble through creating additional SEW losses due to R&D under-investment, and increasing the weighing of potential SEW gains from such investment. When decision makers confronted with a mixed gamble anticipate greater potential for gains relative to losses, they are more likely to take the gamble. Thus, a family firm with strong institutional investor presence is likely to invest more in R&D; in other words, institutional investor ownership attenuates family firm under-investment in R&D. Therefore:

**Hypothesis 2:** As institutional ownership increases, high technology family firms are more likely to invest in R&D, such that increasing institutional investor ownership weakens the negative relationship between family ownership and R&D investment.
Related Diversification. Related diversification provides another example of a critical strategic decision confronting family firms that will affect the mixed gamble associated with R&D. Diversification is related if the businesses being combined have “a common skill, resource, market or purpose” (Rumelt, 1974: 29), and has been argued to lead to long run benefits for firms who execute this strategy successfully. The expected return to the firm’s core technology can be increased by applying it to related products (Granstrand, 1998; Johnson & Liu, 2011). This suggests that the benefits of R&D – or the potential gains in the mixed gamble – are likely to be greater when the firm has higher levels of related diversification.

In terms of the potential socioemotional gains from R&D in the presence of related diversification, the family may have an emotional attachment to the technologies or products/services that are common to the firm under its diversified but related portfolio. Thus, the success of these products is directly related to family SEW. Higher levels of related diversification will multiply the reach and longevity of these products/technologies, and thus the socioemotional benefits of relying on the “tried-and-true” methods of operations, utilizing the knowledge already accumulated by the family. This also allows the family to retain relatives in key positions and limit hiring external talent, which might dilute the family’s SEW. Thus, the potential SEW gains in the family firm’s mixed gamble will be greater in the presence of higher levels of related diversification. In other words, as related diversification increases, the potential financial and—importantly—socioemotional gains from R&D investment increase accordingly.

Second, related diversification lessens the risk posed by operating in a single product market, while allowing the family to maintain control – hence preserving, or minimizing potential losses to SEW. Theory and research indicate that related diversification, particularly in high technology sectors, requires more centralization compared to unrelated diversification (Hill
& Hoskisson, 1987) and thereby facilitates family control. Third, related diversification can promote much needed organizational learning while preserving control over core technologies, meaning that the potential SEW losses will be again minimized (Garcia-Vega, 2006). In sum, higher levels of related diversification are likely to mitigate the family’s loss of control and thus SEW losses in their R&D mixed gamble.

The above arguments suggest that related diversification is likely to increase the family owners’ perception of the potential SEW gains and reduce the potential for SEW losses associated with R&D investment. Thus, at higher levels of related diversification, the weighing of potential gains and losses is likely to encourage the family firm to invest more rather than less in R&D, narrowing the gap in R&D investment between family and non-family firms. Formally:

**Hypothesis 3**: As related diversification increases, high technology family firms are more likely to invest in R&D, such that increasing related diversification weakens the negative relationship between family ownership and R&D investment.

**The Amplifying Role of Performance Hazard**

*Performance Hazard and Institutional Investors.* Research examining the effect of past performance upon family firm decision-making has suggested that as performance declines, the family firm is likely to become more economically motivated (Gomez-Mejia et al., 2007; Chrisman & Patel, 2012). Prior research has found that performance shortfalls relative to peers are likely to motivate family firms to increase their R&D investments (Chrisman & Patel, 2012). Feedback from poor performance is likely to lower the influence of prospective SEW losses (argued to lead to family firm under-investment in R&D), given that greater priority is given to economic goals. Further, if firm performance is unsatisfactory and performance hazard is substantial, the family firm may have suffered actual SEW losses due to negative publicity associated with poor performance, especially if the firm is lagging behind industry peers. This
implies that when firm performance is lower, the family may try to reverse a situation that poses dual financial and SEW threats to the family, and thus invest more in R&D. This will be especially the case in high technology industries, where firms’ potential performance and associated SEW gains (due to enhanced competitive position) are more closely tied to their R&D investments. Together, the reduced likelihood that SEW losses will be heavily weighted in the calculus and the increased focus on potential gains from R&D investment suggest that the family firm will consider that they have less to lose and more to gain in the R&D mixed gamble when performance is lower. In sum, we expect that as their performance shortfall relative to peers gets larger, family firms in high technology industries will amp up their R&D investments.

However, beyond this direct moderating effect, we expect that as performance hazard increases, the pressure from institutional investors to invest in R&D—and ameliorate current competitive standing—also rises. When the firm is performing poorly, the family has little leverage in trying to resist institutional owners’ wishes and is more likely to take their preferences into account. Trying to resist pressure to invest in R&D when performance hazard is high is likely to lead to an even greater conflict with institutional owners and greater damage to firm reputation, resulting in SEW losses for the family. Thus, resisting R&D is associated with higher SEW losses when firm performance is poor and institutional owners are relatively prominent. This means that performance hazard should intensify the positive effect of institutional ownership on R&D investment. Therefore:

**Hypothesis 4:** For family firms in high technology industries, performance hazard strengthens (amplifies) the effect of institutional ownership on R&D investment.

**Performance Hazard and Related Diversification.** We have used the mixed gamble logic to describe how family firms in the high technology sector with higher levels of related diversification are likely to anticipate greater gains from R&D. We further suggest that this
effect will depend upon the firm’s performance hazard. As discussed above, firms that face higher levels of performance hazard are more likely to succumb to institutional investors’ preferences for higher R&D investment. In the case of institutional ownership, the amplifying (positive) effect of performance hazard is through potentially high dual SEW–financial losses for the family associated with not investing. In the case of diversification, we expect that firms with higher levels of related diversification and subject to performance hazard are more likely to increase their R&D investments as it represents an efficient way of preventing long-term dual SEW and financial losses.

Concerning SEW, the family may feel psychologically attached to the firm’s existing technology and/or product portfolio spanning various related businesses and hence may try harder to protect them when faced with a higher performance hazard by investing in R&D. Theory and evidence also suggest that related diversification, particularly in high technology sectors, requires more centralization compared to unrelated diversification (Hill & Hoskisson, 1987) and this enhances the enjoyment of control, which in turn may induce family firms to be more active (by investing in R&D) to prevent this form of SEW loss as performance hazard increases. Concerning the financial aspect, when related diversification is high, R&D investments become a key way to realize positive returns across a variety of (related) product lines, and thus may help deal with performance hazard in an efficient, synergistic fashion – yielding unique synergies between financial and socioemotional forms of wealth. Thus:

**Hypothesis 5:** For family firms in high technology industries, performance hazard strengthens (amplifies) the effect of related diversification on R&D investment.

**METHODS**

**Sample and Data**

The starting point for constructing our sample was the universe of firms covered by the
Corporate Library database, which includes publicly traded companies in the Russell 3000, S&P 1500 and TSX60. We then focused on firms in high technology industries following Li, Eden, Hitt, and Ireland (2008), who examined R&D alliances in high technology industries. Similar to Li et al. (2008), our definition of a high technology industry comes from the AeA, the largest association of high-tech companies in the United States. Based on their categorization, we included high-tech manufacturing industries (SIC codes 357, 365, 366, 367, 381, 382, 384, and 386) and high-tech service industries (SIC codes 481, 482, 484, 489, and 737). For firms in these industries, innovation is crucial for survival and financial success (Li et al., 2008).

The period of our study spanned six years (2004–2009). Data were obtained from the Corporate Library, COMPUSTAT, Thompson Financial, and the U.S. Patent and Trademark office. The initial sample of firms in high technology industries included 3937 firm-year observations; the lack of institutional ownership data reduced our observations to 3254. The final sample we utilize, after other missing data, is an unbalanced panel of 610 firms over 6 years – a total of 2353 firm–year observations. Our sample includes 142 family firm–year observations, and 401 founder–firm year observations; the remainder are for non-family controlled firms.

Dependent Variable

R&D Investments. Following previous studies, we calculated R&D investment as the ratio of R&D expenditures to sales (Chrisman & Patel, 2012). R&D is considered a measure of a firm’s commitment to innovation and an investment associated with risk, or uncertain payoffs (Balkin et al., 2000; Baysinger & Hoskisson, 1989; Devers, McNamara, Wiseman, & Arrfelt, 2008). These characteristics make it well suited to the theoretical framework of the BAM.

Our models provided for a one-year lag between the measurements of predictors and the size adjusted R&D dependent variable. Following SEC rules, COMPUSTAT does not report
“very small R&D amounts that are not material to a firm's decision-making” (National Science Foundation, 2010). Because of this, many values for R&D expenditures in COMPUSTAT appear to be missing; as they are not missing-at-random however, these observations cannot be simply omitted from analysis. Since the 1970’s, firms have been required to separately expense all but negligible R&D investments (O’Brien, 2003; White, Sondhi, & Fried, 1994); thus, treating missing values as negligible investment, or “unobservable minimal R&D expenses” (Chen & Miller, 2007: 372), is both theoretically justifiable and common practice (O’Brien, 2003).

Following previous studies (e.g., Chang & Dasgupta, 2009; Coles, Daniel, & Naveen, 2006; O’Brien, 2003; Uotila, Maula, Keil, & Zahra, 2009), we replace missing R&D values with a 0, treating extremely low levels as zero investment. We also included a dummy variable “R&D not reported” to control for any potential effect of ‘missing’ R&D data.

Independent and Moderator Variables

*Family Firm.* We classify *family firms* using a dummy variable (equal to 1) based on the Corporate Library’s ownership category. Corporate Library’s “family firm” categorization indicates a company where family ties play a key role in both ownership and board membership. Family members may not have “full control of the shareholder vote (greater than 50 percent), but will generally hold at least 20 percent” (Barrett, Marshall, Hodgson, Young, & Cook, 2006: 2). This definition is consistent with prior studies on publicly traded family firms, which considered a firm to be a family firm if at least two directors had a family relationship, and family members held a substantial block of voting stock (e.g., Allen & Panian, 1982; Daily & Dollinger, 1993; Gomez-Mejia, Larraza-Kintana, & Makri, 2003; Gomez-Mejia et al., 2010).

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1 R&D expenses are reported as one aggregate item; therefore, it is unlikely that R&D reporting provides valuable, private information to competitors.

2 The results are substantively unchanged if we drop the ‘missing’ (low or zero level) R&D investment observations from the analysis. We thank a reviewer for recommending this additional robustness check.
Operational definitions of family firms lack consensus in the literature (see a review by Gomez-Mejia et al., 2011). Using a continuous measure of family ownership as an alternative to the one described above would raise other issues. As noted by Gomez-Mejia and colleagues (2011: 659) “The potential existence of unknown threshold effects poses a problem when relying on continuous measures of ownership (...) Researchers must therefore defend their choice of measures depending on the sample.” Importantly, our theory pertained to differences in ownership kind (family vs. non-family firms) rather than differences in level (within family firms), which would call for a continuous measure. We believe that the established Corporate Library convention to designate a firm as having strong family control is appropriate for our target population of publicly traded companies. Additional robustness tests (described later) are utilized to ensure that our results are not driven by the operationalization of family firms. Importantly, we treat founder-controlled firms as a separate group, setting the founder firm dummy variable equal to 1 if the Corporate Library’s ownership category field classifies them as such – indicating a company where “the CEO or chairman is both a founder and a principal shareholder (holds more than 10 percent) of the total voting power” (Barrett et al., 2006: 2).

Institutional Ownership. The measure was the percentage of equity ownership by mutual and pension funds, the two largest groups of institutional investors, calculated as the sum of their ownership divided by common shares outstanding (Bushee, 1998).

Related Diversification. The firm’s diversification was measured with the validated and extensively used entropy index (Hoskisson, Hitt, Johnson, & Moesel, 1993), which considers both the number of segments in which a firm operates and the proportion of total sales each segment represents, capturing diversification across 4-digit Standard Industrial Classification (SIC) industries. We calculated this measure as follows:
\[ \text{Entropy} = \sum_i [P_i \times \ln(1/P_i)], \]

where \( P_i \) represents the proportion of sales attributed to business segment “i.” Following Lim et al. (2009), we compute a separate index for related diversification (the firm’s total product diversification is the sum of related and unrelated diversification).

**Performance Hazard.** Gomez-Mejia et al. (2007, 2010) report that family owners tend to use relatively simple heuristics to gauge whether or not the firm is doing well or poorly. The measure we used is an industry-median-adjusted ROA – this benchmark signals to the firm how well it is doing compared to firms in the industry, and is not sensitive to outliers. If a firm in our sample exhibits high ROA compared to the industry median firm, this is interpreted as a lower performance hazard; conversely, if the firm has much lower ROA than the industry median firm, this is indicative of a higher performance hazard. As such, we used an inverse of this measure to ease interpretation. This measure is better suited for our purposes than more extreme measures of performance hazard, such as proximity to bankruptcy (Chen & Miller, 2007), high probability of failure (Gomez-Mejia, Nunez-Nickel, & Gutierrez, 2001) or severe financial distress (Greve, 2003), because firms may reduce R&D expenditures at the extreme in order to conserve cash in hopes of prolonging short-term survival (Brown & Petersen, 2011).

**Control Variables**

We included a comprehensive set of control variables. First, we controlled for firm risk, which was particularly pertinent given that our theory focused on risk associated with SEW. This variable was operationalized as volatility, or the log of the variance of the firm’s stock returns during the year (Aggarwal & Samwick, 1999; Coles et al., 2006; Demsetz & Lehn, 1985). Additional controls included firm size, measured as the natural logarithm of the firm’s number of employees (Anderson & Reeb, 2003a,b), cash on hand (Brown & Petersen, 2011), firm age
(Berrone et al., 2010), a dummy variable for “R&D not reported” (Hoskisson et al., 2002), and organizational slack (Greve, 2003). Available slack was measured using a firm’s ratio of assets to liabilities, which has been found to influence the amount of funds available for R&D (Baysinger & Hoskisson, 1989). Potential slack was measured using the firm’s ratio of debt to equity (Geiger & Makri, 2006). We also controlled for external contextual factors by including year dummy variables to account for fluctuations in general macroeconomic conditions and other time-dependent variation. Finally, we controlled for industry membership at the two-digit SIC code level using dummy variables, which explicitly accounted for any industry-related variance.  

Analysis

Because our data were panelized and the dependent variable was both limited and censored—that is, it did not take negative values and contained numerous observations with values equal to 0—a tobit panel data methodology was most appropriate to test our hypotheses. Specifically, we employed tobit firm random effect models (i.e., setting the firm identifier as the group variable). Unlike standard linear panel models, where fixed effect estimates are always consistent, the reverse is true in a tobit framework (please see Stata, 2010); thus, fixed effects are not appropriate in this setting. For these reasons, we used random effect maximum-likelihood (M-L) based tobit models for panel data for our primary analyses. All the continuous variables used in interaction terms were mean-centered. Individual variable VIF values were below 5, and mean VIF was below 2.2 for all models, indicating that multicollinearity is not a concern.

RESULTS

Descriptive statistics and correlations of the variables are provided in Table 1. Table 2 shows the results of panel tobit models predicting R&D investment. Note that in Model 2 of

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3 We also performed additional analyses with a ‘service industry’ indicator variable added to the models. The indicator was not statistically significant, and our results were virtually unchanged.
Table 2, the coefficient of the family firm dummy shows a negative and significant (p<0.01) relationship with R&D investment, which supports Hypothesis 1. However, the coefficient of the founder firm dummy variable is not significant, indicative of no statistical difference between founder-controlled firms and non-family firms.

*** Insert Tables 1 & 2 about here ***

Hypothesis 2 argued that the negative relationship between high technology family firms and R&D investment is moderated by institutional investor ownership, such that increasing institutional investor ownership weakens the negative relationship. In Model 3 of Table 2, the coefficient of the interaction between the family firm dummy variable and institutional ownership percentage is positive and marginally significant (p=0.063), providing moderate support for Hypothesis 2. Hypothesis 3 predicted that high technology family firms are more likely to invest in R&D as related diversification increases. The coefficient of the interaction between the family firm dummy variable and related diversification in Model 3 of Table 2 is positive and significant (p<0.01), providing strong support for Hypothesis 3. Model 3 also shows that family firms invest more in R&D as their performance shortfall relative to competitors (i.e., performance hazard) increases, which is consistent with prior research.

Hypothesis 4 posited that performance hazard strengthens (amplifies) the effect of institutional ownership on R&D investment in family firms. The coefficient of the interaction between the family firm dummy variable, institutional ownership and performance hazard in Model 4 of Table 2 is negative and marginally significant (p=0.068), but in the opposite direction to the one predicted, providing no support for Hypothesis 4. We discuss the implications of this surprising finding in the discussion section. Finally, Hypothesis 5 predicted that performance hazard strengthens the effect of related diversification on R&D investment in family firms. The
coefficient of the interaction between the family firm dummy variable, related diversification and performance hazard in Model 4 of Table 2 is positive and significant (p<0.01), providing strong support for Hypothesis 5.

Robustness Tests

Endogeneity. We considered the possibility that our main independent variable—the family firm indicator—is endogenous, and used instrumental variable (2SLS) regressions to address this issue. We selected two instruments that should be related to the firm’s family status—the amount of general/administrative expenses, and dividends issued (representing efficiency and dividend policy, respectively). This selection was theoretically motivated—family firms are argued to have lower agency costs vis-à-vis non-family firms, and prior research established that corporate payout/dividend policy (Fenn & Liang, 2001) and firm efficiency (Ang, Cole, & Lin, 2000) are both indicators of the level of agency costs at the firm. The two requirements for a good instrument are that it be relevant—i.e., not a weak predictor of the (potentially) endogenous variable—and valid/exogenous—i.e., not correlated with the error term of the second-stage equation. Statistical tests confirmed both instrument relevance and exogeneity.\(^4\) We then tested whether there was any evidence that the family firm dummy was in fact endogenous. At \(\alpha = .05\), both the Durbin chi-square test and the Wu-Hausman F-statistic failed to reject the null hypothesis, suggesting that the family firm dummy is not endogenous. Thus, because endogeneity corrected models were not warranted, and due to the fact that a tobit instrumental variable procedure for panel data was not available, we do not present 2SLS regression results—as they could be biased—but those of the M-L based panel tobit models.

\(^4\) First, the F-statistic for the test for instrument relevance was equal to 11.68 (Prob > F = 0.000), which provides evidence that our instruments were relevant and not weak predictors (Staiger and Stock, 1997). Second, because more instruments than endogenous regressors were present, a test of instrument exogeneity was possible (Wooldridge, 2002). Both the Sargan and the Basmann test failed to reject the null of exogeneity.
Alternative Innovation-related Outcomes. We also examined the effect of family ownership on the number of patents, representing R&D outcomes. We obtained annual data for 2005 and 2006 from the U.S. Patent and Trademark Office (NBER: Patent Data Project). More specifically, we gathered data on the number of patents the firm applied for in 2005 or 2006. The analysis showed that family ownership was negatively related to the number of patents applied for; however, founder-controlled firms were not different from non-family firms on this dimension. This is in line with our primary results that show founder firms to be not statistically different from non-family firms in terms of R&D investment. This confirms that, in general, family ownership in high technology firms is associated with lower innovation inputs (i.e., R&D investment) as well as lower innovation outputs (i.e., patents), but there is a marked difference between founder-controlled and later generation family firms, in line with extant literature.

Replication with an Alternative Sample. In order to provide the most stringent robustness check, we tested our hypotheses on a different set of firms, over a different time frame, using a different operationalization of the family firm variable. Specifically, we used an independent sample of 402 high technology firms, half of them being family-controlled and the other half not family-owned. The starting point for identifying the list of family firms were the lists of firms identified as family-controlled by Anderson and Reeb (2003) and by Gomez-Mejia, Makri, and Larraza-Kintana (2010). 201 firms met the two conditions, board control and ownership, that are often identified in the literature as necessary for a firm to be considered as family controlled. The subsample of 201 nonfamily firms was randomly selected from the large group of publicly traded firms that did not meet either of those conditions. Mean comparison t-tests between

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5 Please note that 2006 is the last year patent data is available. Because some firms in our original sample did not apply for patents during 2005 or 2006, we gathered data on a subsample of firms (934 firm-year observations).

6 Following prior literature and adopting a conservative approach to defining family control, we created a dummy variable that took the value of 1 if at least two members on the board were family members and the family owned 10 percent or more of voting stock in 1998; firms that did not meet both criteria were coded as 0.
family-controlled and non-family firms revealed that the groups did not significantly differ on key variable measures, indicating that the samples were adequately matched. The average R&D intensity for all firms in our sample during the nine year period was 10 percent, exceeding the minimum 5 percent R&D intensity cut-off that has often been used in the past to classify a firm as “high technology” (e.g., Balkin & Gomez-Mejia, 1987; Balkin et al., 2000; Daim et al., 2010).

The sample period spanned nine years, from 1994 through 2002 (entirely before our primary sample). We ensured that the firms in this sample were not present in our primary sample; following a matching procedure, any firms that overlapped were omitted from analyses. As such, the two samples are independent, both in terms of the time period covered and the composition of firms. We used analogous dependent, independent, and control variables. We again found that family firms invest less in R&D than their nonfamily counterparts (p<0.05); however, this negative relationship is attenuated by institutional investor ownership (p<0.05) and increasing degree of related diversification (p<0.10), confirming the results of Hypotheses 1–3.

Moreover, performance hazard strengthens (amplifies) the effect of related diversification on R&D investment (p<0.01), in line with Hypothesis 5. This represents an extensive robustness check, and helps mitigate the concern that our results are driven by sample-specific (firm-specific or time-specific) factors. It also suggests that our results are not sensitive to the particular definition of family firms. Interestingly, here we find that performance hazard strengthens the effect of institutional investor ownership on family firms’ R&D investment (p<0.10). This finding is in line with our Hypothesis 4, but opposite to the result obtained with our primary sample. We discuss these contradictory findings in the discussion section.

We again tested whether founder-led firms differ from non-family firms, and found that founder firms did not differ statistically in terms of their R&D investment, further reinforcing the
conclusion that founder-controlled firms and later generation family firms exhibit significant differences in their decision-making with respect to R&D and new product development. Lastly, using data on family CEO status available for this sample, we found that family firms run by family member CEOs invested even less in R&D than those run by non-family CEOs. This supports the idea that differences in the mixed gamble facing the family CEO and family owners result in strategic choices that reinforce a common agenda.

DISCUSSION

Our study examined how the R&D decision differs for family firms due to the influence of socioemotional factors upon the family’s R&D mixed gamble in a high technology context. To do so, we have combined behavioral agency research – BAM and the concept of mixed gambles in particular – with literature examining the role of family SEW in decision-making. High technology industries provide an empirical setting that elucidates the socioemotional effects upon the family’s R&D mixed gamble, given the criticality of R&D to success and ongoing survival in this setting. The findings provide support for our theoretical arguments that socioemotional influences upon the family’s mixed gamble affect family firm R&D decisions. Our study provides important contributions to the study of family firm decision-making.

We advance the family firm literature by offering a more nuanced theoretical explanation for family firm investment in R&D. We do so using an empirical setting in which the consequences of R&D under-investment are more severe (the high technology sector), making the potential gains and losses in the R&D mixed gamble – or the heuristics associated with R&D investments – more likely to be at the forefront of the minds of those making the R&D decisions within the firm. This reflects the idea that the vast majority of strategic decisions will have potential for both loss and gain outcomes, which is representative of a mixed gamble (Bromiley,
2009). Consistent with this logic, our theory suggests that family firms weigh potential socioemotional losses against potential gains when making R&D investment decisions. That is, family owners are not solely motivated by the need to preserve family SEW; they will be prescient with regard to potential socioemotional gains, such as those deriving from economic success that may flow from enhanced reputation or wider exposure of the family name. The need to consider the potential for socioemotional gains prompts a fresh approach to analyzing family firm decision-making. Equally, we highlight the need to explicitly consider the socioemotional consequences of the potential negative economic results of family firm decisions.

Importantly, we have demonstrated that certain key factors will influence the degree to which the family firm’s mixed gamble will differ from non-family firms. Large within-group variance is common in social science, as evidenced by large variance of behaviors within family firms (Chrisman & Patel, 2012). Our study helps to deepen our understanding of the drivers of within-family firm variance in R&D decisions, by concentrating on the key dimensions of corporate governance, corporate strategy, and firm performance. For instance, we theorize and show that institutional investor involvement is likely to shift the mixed gamble focus away from SEW losses and weigh more heavily the prospect of further financial and SEW gains. This is consistent with empirical studies from the agency theory literature in finance (e.g., Aghion, Van Reenen, & Zingales, 2009) and management (e.g., Hoskisson et al., 2002; Kochhar & David, 1996) suggesting that the presence of institutional investors is positively related to R&D investments and innovation; yet, we have offered an alternate explanation for this phenomenon in the context of high technology family firms.

We also predicted that performance hazard, or performance shortfall relative to competitors, will increase the positive influence of institutional investors. The results obtained
using our alternative sample are in line with our original theory. However, surprisingly, we found the opposite effect when using our primary sample. More specifically, when performance hazard increases in family firms, the influence of institutional investors on R&D investments decreases. This effect can be explained by research suggesting that family firms are relatively less risk averse than non-family firms when performance is below aspirations (Chrisman & Patel, 2012; Gomez-Mejia et al., 2010). That is, non-family principals are more likely to experience threat rigidity and less likely to take additional risk when experiencing declining performance. This explains why firms with a relatively high proportion of institutional ownership are more threat-rigid – this group of owners is not driven by SEW preservation motives, making firms with high institutional ownership behave more like non-family firms. Our results suggest that this effect is more pronounced post-Sarbanes Oxley (SOX), which is in line with research that demonstrates that Sarbanes-Oxley had the consequence of decreasing corporate risk-taking, especially in firms that had high R&D expenditures pre-SOX (Bargeron, Lehn, & Zutter, 2010). The results reported herein would seem to suggest that this legislation impacted the willingness of institutional owners to invest in R&D in the face of declining performance, but this was not the case for family owners.

Finally, this study has demonstrated the utility of the BAM framework and in particular, the modified BAM framework infused with the concept of mixed gambles (see Martin et al., 2013). R&D is a common operationalization of risk taking given its uncertain pay-offs. Martin and colleagues (2013) demonstrated that in order to predict strategic risk taking, such as R&D decisions, it was beneficial to expand focus beyond loss aversion as the theoretical driver. The decision maker will also be encouraged to take risk due to the prospect of gains that flow from those decisions. Building on this literature, the BAM and the concept of mixed gambles has
allowed us to explain family firm decision-making and how it tends to vary across family firms.

**Theoretical Extensions, Limitations and Conclusion**

In most social science research, within-group variance on any dimension tends to be large (Hannan & Burstein, 1974) and high technology family firms are probably no exception. This means that the effects shown here represent general tendencies and it could well be that many family-controlled high technology firms follow a high R&D investment strategy. Albeit in a different population, Gomez-Mejia and colleagues (2007) found that a significant proportion, though still a minority, of family-controlled olive oil mills relinquished control in search of financial gains by joining a co-op. What leads some family firms to place a high priority on financial rather than SEW concerns still remains a relatively unexplored issue and represents an important area for future research. Another fruitful avenue for future research would be further examining the role of institutional context in influencing family firm decision-making. Our study is set in the United States, a country with well-developed financial institutions, relatively strong shareholder rights, and greater institutional ownership (Useem, 1996). It could well be that the role played by institutional investors (here, in influencing R&D investment) is filled by other groups and entities in different countries. For example, in Germany this role may be fulfilled by banks, which commonly play a key role in firm ownership and governance. In emerging economies this role may be played by foreign institutional investors. Research suggests that national governance systems can be highly influential (Gedajlovic & Shapiro, 1998); we thus encourage comparative studies in the family firm arena, especially in developing economies (e.g., see Acquaah, 2012).

Our study also provides interesting practical insights. The mixed gamble framework elucidates the importance of weighing the potential for both gains and losses when making
strategic decisions such as R&D. That is, our study emphasizes to practitioners that R&D investments should be guided by analysis detailing the potential for losses that could be incurred through failing to make those investments as well as the potential performance benefits that could be derived from successful R&D projects. This is especially important in the high technology setting given the greater importance of R&D to firm survival in these highly dynamic environments (Teece et al., 1997). Boards of directors and family firm stakeholders should insist that this analysis of potential outcomes of R&D decisions is adequately carried out.

Our study is subject to the limitation of using binary measures of family firm ownership in both our primary and replication sample. However, this has been common to the majority of family firm studies due to the difficulty of obtaining a continuous measure; moreover, our focus has been on examining differences in kind rather than level. Future studies could attempt to examine differences in degrees of family ownership upon family decision-making. As discussed above, we are also limited to one country, and a particular institutional context, and encourage future studies to ground their research in other institutional settings. We also focused on a particular form of corporate strategy – the degree of related diversification. An interesting extension would be examining the role of the firm’s merger and acquisition (M&A) strategy, which research suggests can become substitutes for innovation (Hitt et al., 1991).

In conclusion, while loss aversion with regard to SEW has predictive value with regard to family firm R&D decisions, our study suggests it is also possible that family owners are influenced by the potential for SEW gains when making R&D investments. This approach has proven useful for explaining family under-investment in R&D and the variation in this phenomenon across family firms, and provides a platform for future research examining family firm decision-making.
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